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Climate Change Adaptation in Southwest Bangladesh:

Vulnerability and Gender Inequality

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Abstract

The threat of climate change looms large for Bangladesh, located between the Ganges Delta and the Bay of Bengal. Climate change is expected to impact the lives and livelihoods of hundreds of thousands of people in Bangladesh, particularly those who live in coastal areas and are poor or disadvantaged. Women are considered to be particularly vulnerable as a result of gendered roles, responsibilities and limited entitlements. While there is a growing body of work regarding the ways in which gender, class, and livelihoods contribute to climate change vulnerability in Bangladesh, there is little scholarship examining adaptation in terms of its capacity to address the social and political aspects of vulnerability. In addition, much gender and climate change research suffers from static representations of women and gender relations.

To address these gaps in the literature, this thesis uses adaptive capacity vulnerability theory, in conjunction with feminist political ecology, to examine the transformative capacity of adaptation initiatives in the Bagerhat region of Southwest of Bangladesh. By adopting a bottom-up approach to social enquiry, this thesis investigates, 1) The nature and community experiences of environmental and climate changes in the region; 2) The social factors that mediate experiences of environmental and climate change, including gender, class and governance; and 3) The ways in which adaptation initiatives interact with underlying causes of vulnerability, with a focus gender.

Employing an embedded case study approach and utilising a range of participatory methods, this thesis makes four key findings. Firstly, climate change in Southwest Bangladesh is situated within local political, economic and ecological contexts. The impacts of climate change were found to be 'magnifying' a range of pre-existing environmental challenges that have occurred as a result of political and economic interventions in agriculture in the Southwest. Secondly, women's experiences of, and responses to, environmental change were being shaped by gendered roles, responsibilities and expectations. Gender in this context was undergoing changes as a result of material needs, and women's own agentic desires to help their communities. However, these shifts were having little impact on women's broader capabilities and entitlements. Thirdly, the adaptation initiatives observed were doing little to enhance community capacities in climate change adaptation, and were failing to respond to macro political and economic issues. Most adaptation initiatives, including small-scale improvements to farming and livelihoods, had largely failed to address poverty, gender inequality or the underlying causes of environmental change. Rather, these

initiatives were assigning obligations to communities, allowing governments to abdicate their responsibilities. Finally, what these findings suggest is that in order to initiate adaptation measures that are sustainable and socially just, there is a need for an approach that is inclusive and transformational – one that goes beyond the symptoms and manifestations of environmental change to incorporate understandings of the socially-constructed nature of disasters, risk and environmental change.

Declaration by author

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List of Abbreviations

BCCRF	Bangladesh Climate Change Resilience Fund
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BCCTF	Bangladesh Climate Change Trust Fund
BRRI	Bangladesh Rice Research Institute
CCGAP	Climate Change Gender Action Plan
CBA	Community-Based Adaptation
COP21	The 2015 United Nations Climate Change Conference
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DMC	Disaster Management Committee
FPE	Feminist Political Ecology
GMB Water Basin	Ganges-Brahmaputra-Meghna Water Basin, a transboundary water basin that includes China, Nepal, India, Bangladesh and Bhutan.
HYV	High-yielding varieties of rice and other crops
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
NAPA	National Adaptation Programme of Action
NGO	Non-Government Organisation
RVCC	Reducing Vulnerability to Climate Change Project
UN	United Nations
UNICEF	United Nations Children's Fund
VGF Card	'Vulnerable Group Feeding (VGF) Card' Program, provides food for low-income and vulnerable groups
WDB	Water Development Board

Glossary of Bangla Terms

Bagda	Salt water shrimp
Beel	Swampy lowland
Bideshi product	Foreign products
Birri	Colloquial term for improved varieties of rice and other crops
Bondok	Land mortgage system whereby a tenant pays the owner for the land, and is able to farm the land until such time as the landowner can repay
Boro Shomosha	Big problem
Deshi	Local/Bangladeshi, refers to varieties of crops
Dhan	Paddy rice
Ektee Bari Ektee Khamar (EBEK)	'One House One Farm' Government Microcredit Project
Gher	Shrimp and aquaculture pond
Golda	Fresh water shrimp
Jolobayu Poriboton	Climate Change
Krishi	Farmer
Mishti pani	Sweet/fresh water
Macha loan	A microcredit loan specifically for aquaculture production
Monga	Seasonal hunger
Mud cutting	Manual excavation works to dig canals or build embankments
Polder	Dutch word describing a section of land surrounded by dikes or embankments
Purdah	The religious and social practice of seclusion of women
Rakhali	A cow-lending system, whereby cattle caretakers are able to take ownership of calves.
Taka	Bangladeshi currency
Upazila	Administrative Sub District. Administrative areas in Bangladesh consist of: Division → District → Upazila/Sub-district → Union → Ward → Village
Union	Administrative area below upazilas

Chapter One: Introduction

Climate change, the result of carbon emissions associated with industrialisation, indicates the need for rapid process of change in technology, human societies and relationships with nature (Beck, 2010). As we enter the anthropocene, the time in which human activity becomes the dominant influence on the environment, the way human societies respond to rapid environmental and climate change has become an ontological issue. The boundaries between environments and societies are blurred and we face challenges that are underpinned by, and threaten, deep-seated societal structures and norms. However, within this, we have available to us what Beck (2014: 169) describes as "emancipatory catastrophism", an opportunity to respond to intersectional injustices, including colonial histories and other institutional inequalities. Klein (2014: 34) similarly argues for the "revolutionary power of climate change", with the capacity for resources and efforts needed to address climate change to simultaneously address poverty and inequality. Climate change adaptation, described as "specific actions that individuals or societies take to reduce or minimise the risks posed by a changing climate as well as the broader processes that shape these responses" (Bee, 2014: 4), could be reconceptualised as a tool for broader social change.

As an important case study, Bangladesh is considered to be one of the parts of the world most vulnerable to climate and other environmental changes, due to its geography and low lying topography. 60 per cent of the country is less than six meters above sea level (Mirza, 2002). The Global Climate Risk Index 2016, which examines data on storms, floods, temperature extremes, fatalities and population and economic data, has listed Bangladesh among the top countries most affected by natural disasters for 9 of the last 10 years. The Maplecroft Climate Change Vulnerability Index, which looks at disasters, sea level rise, population and dependence on agriculture, lists Bangladesh as number one in the extreme risk category (Maplecroft, 2011). While both indexes have limitations in terms of methodology and indicators, they are nevertheless indicative of both the vulnerability of Bangladesh and the crisis discourse surrounding Bangladesh more broadly. Al Gore's 'An Inconvenient Truth' (Gore, 2007: 115), discussing the country's low topography and the risk of sea level rise, states "In Bangladesh and the city of Calcutta, 60 million people would be uprooted. That's roughly the entire population of France or the UK or Italy". This climate discourse sits alongside Bangladesh's well-documented history of natural disasters and human-induced environmental issues. Cyclones, floods and drought are part of everyday life, and part of the national identity. Some argue that the 1970 Bhola cyclone and flood, which killed up to

500,000 people, was a contributing factor in the 1971 War of Independence between East and West Pakistan. This led to the creation of Bangladesh, with the disaster and response opening space for political transformations (Eskander & Barbier, 2014; Olson, 2005; Pelling, 2011).

For communities in the Southwest region of Bangladesh (referred to here as the Southwest), the potential impacts of climate change – sea level rise, cyclones, changing rainfall patterns and increasing temperatures – sits alongside a range of existing social and environmental challenges. The Southwest is one of the most populated regions of the country and is facing high levels of poverty (Kumer, & Roy, 2017). The area is highly exposed to natural disasters (Saha, 2014) including storm and tidal surge flooding. In the last ten years, the area has been affected by two major cyclones. Sidr (2007) and Aila (2009), both category five cyclones, made landfall in the Southwest, causing storm surges, and destruction of embankments that lead to widespread salinity intrusion (Coirolo, Commins, Haque, & Pierce, 2013; Dasgupta, Huq, Khan, & Zahid, 2016; Warner et al., 2012). Salinity is widely documented as a major environmental challenge in the region (UNICEF, 2014), with a saline front stretching up to 100 kilometres inland (Khan et al., 2011a). Salinity can be traced to a number of causes, including storm surges pushing sea water upstream; the Farakka Barrage, a dam in India, built in the 1970s, which has significantly altered the hydrology of river systems in the east of the country (Mirza, 1998); and the proliferation of salt-water shrimp propagation in the region, which has encouraged a build-up of salinity (Swapan & Gavin, 2011). While the impacts of climate change and local environmental changes intersect, recent scholarship has begun to examine processes of 'depoliticisation' (Paprocki, 2015) and 'climatisation' (Grant, Tamason, Kj, & Jensen, 2015) whereby a focus on climate change in policy discourse that has obscured the impacts of local environmental changes.

Rich political ecology scholarship on environmental injustice has examined the ways in which social inequalities can result in vulnerability to environmental risks (Buckingham & Kulcur, 2009). Drawing on adaptive capacity vulnerability theory (Preston & Stafford-Smith, 2009), the root causes of vulnerability to environmental challenges often lie in deeply ingrained societal, political and economic structures. Within this framework, vulnerability to environmental challenges lies at the intersection of exposure and sensitivity to changing conditions, and social categories and power relations that mediate the capacity of communities to respond. As a result, climate change is argued by many to have racial, class and gendered implications (Black, 2016).

Feminist, gender and development literature has begun to explore the particular sensitivity of women in the face of climate change (Alston, 2013; Demetriades & Esplen, 2010; Sultana, 2014),

examining the ways in which gender relations – distribution of labour, access to resources and entitlements, political and economic power – influence interactions with changing environments. Mortality rates due to natural disasters are a telling example. In Bangladesh, more women than men die during natural disasters and face gender-based violence in post-disaster periods (Fisher, 2010; Neumayer & Plumper, 2007). Beyond natural disasters, the international literature has documented women's increased workloads in changing environments (Djoudi & Bockhaus, 2011), the pressure on women's in terms of food production (Buechler, 2009) and water collection (Vij & Narain, 2016). Feminist political ecology theory and research helps us understand the ways in which unequal gender relations underpin experiences of environmental changes. This suggests that it is at the level of underlying social inequalities that adaptation must work, in order to achieve the emancipatory and revolutionary power suggested by Klein (2014) and Beck (2014). However, there is limited scholarship examining adaptation in terms of its capacity to address the social and macro-economic aspects of vulnerability.

Bangladesh is noted as a world-leader in climate change adaptation (Rai, Huq, & Huq, 2014). Non-government organisations (NGOs), government agencies, United Nations (UN) agencies and communities are pursuing a wide range of adaptation initiatives ranging from technocratic infrastructure responses, to community-based farming initiatives. Within Bangladesh, the discourse regarding climate and environmental change acknowledges Bangladesh as being a victim of climate change. The country has not been a major producer of carbon emissions, yet is now highly exposed to the global consequences. Bangladesh has been part of a block of countries seeking to include 'loss and damage' and climate induced displacement within international negotiations, stressing in particular the impact of sea level rise (Bangladesh Government Delegation, 2015). The Government of Bangladesh has maintained that as a 'least developed country', Bangladesh is not responsible for paying for climate change damage, contending that those countries responsible for climate change should be responsible for financing adaptation and support.

This sits alongside a strong discourse regarding the progress that Bangladesh is making with regards to adaptation. As Environment Minister Anwar Hossain Manju stated as COP21 (Bangladesh Government Delegation, 2015),

> *…. Bangladesh is the innocent victim of the climate change. We are contributing nothing to the climate change. So issues for Bangladesh [that are] important, [include] adaptation, because we need to adapt with the changing scenario. In Bangladesh, climate change is not the threat, threat, what is about to come, but in Bangladesh, climate change is the reality,*

we are facing with all the negative impacts of climate change, so adaptation is the priority for Bangladesh…

Community-based adaptation (CBA) in particular is a well-known hallmark of the adaptation work taking place in Bangladesh. CBA describes an approach to adaptation that focuses on participatory development and advocates for bottom-up, community ownership of livelihood, disaster risk reduction initiatives, alongside strengthening local governance (Rashid & Khan, 2013). Despite the wide proliferation of CBA work through the development sector in Bangladesh, little work beyond project evaluations has investigated the effectiveness of such adaptation initiatives in terms of encouraging broader social change.

Carr (2008a) offers a useful, but disheartening starting point – he argues that adaptation initiatives can at times persist because they fit within established community power structures, including gendered power relations. As Pelling (2011) argues, when established social relations are a key underlying cause of vulnerability, and thus a target for adaptation, change will be difficult to effect. These structures can create historically bound path-dependencies that can problematise processes of change (Wise et al., 2014). Gender inequality emerges as a key factor. While there is informative work on the social barriers to adaptation (Adger et al., 2009), there has been little work examining the gendered nature of adaptation. Asking questions of the social dimensions of adaptation provides essential insights for communities, NGOs and governments pursuing adaptation, and allows for the identification of key opportunities for collective action and change.

Research Aims

Given the proliferation of adaptation in Bangladesh and key gaps in understandings of adaptation from a sociological perspective, in this thesis I examine the impacts of environmental change and adaptation in Southwest Bangladesh. I take a feminist political ecology approach to investigate the underlying social basis of environmental vulnerability in the Southwest, and the ways in which adaptation initiatives are addressing factors. In doing so, I advocate for a gender justice approach to guide transformative approaches to adaptation. I draw on multi-disciplinary literature, including scientific fields, development studies, geography, political ecology and feminist and gender studies, to help highlight the ways in which social inequalities and social power relations influence experiences of climate change and adaptation in Southwest Bangladesh, and the need for transformative adaptation that incorporates gender justice.

The following research questions are underpinned by adaptive capacity vulnerability theory (Preston & Stafford-Smith, 2009), which sees communities' experiences of environmental change as a combination of geographical and socio-political exposure and sensitivity, alongside social, political and economic factors that influence the capacity of communities to adapt. In responding to literature regarding the heightened environmental vulnerability of Southwest Bangladesh, I firstly ask:

> *What environmental changes are taking place in Southwest Bangladesh, and what are the underlying causes? In what ways are communities exposed and sensitive to these environmental changes?*

These questions seek to expand on literature regarding the range of environmental challenges facing communities in Southwest, exploring the historical, political and social underpinnings of these changes and their links to climate change. Exposure and sensitivity are situated as sociological factors, by looking at the underlying political and social causes of environmental change, and the ways in which livelihoods, roles and responsibilities within communities influence interactions with changing natural environments. These questions are explored in Chapter Five.

Within adaptive capacity vulnerability theory, social, political and economic factors mediate community experiences of the environmental changes, described as sensitivity, and influence the ways in which communities can respond to environmental challenges, described as adaptive capacity. As Ensor, Park, Hoddy and Ratner (2015) argue, adaptive capacity captures people's ability to make deliberate responses and changes in complex social-ecological systems, and provides a sociological understanding of the ways in which people are situated within changing environments. The second research question asks:

> *How do social, political and economic inequalities shape the experiences of environmental change in Southwest Bangladesh?*

In expanding on adaptive capacity theory and empirical research, I examine key elements of social inequality, including gender, poverty, knowledge and governance. In particular, I respond to the wide body of gender and environment literature, to look at the ways in which gender, as a key social category, influences vulnerability. I draw on Allen and Sachs (2007) framework examining socio-cultural, material and corporeal relationships between gender and food, to look at the ways in which gender relations lead to differentiated encounters with changing environments. This question is explored in Chapter Six.

Together, the intention of these first research questions is to establish the environmental and social context of Southwest Bangladesh. These questions call for an elicitation of the underlying causes of vulnerability, including the causes of environmental change, and the capacity of communities to respond, and it is these factors to which adaptation initiatives would need to respond. As such, the third research question asks:

> *How do adaptation initiatives interact with the underlying causes of vulnerability, and how is power and agency expressed in adaptation practices?*

Having established the basis of vulnerability in questions two and three, I assess a number of adaptation initiatives observed in the case study communities. I engage with feminist theory to look at the ways in which these adaptation initiatives address the underlying causes of vulnerability, focusing on gender inequality, and the agency of men and women within these initiatives. I advocate for a transformative and gender justice approach to adaptation, whereby gender justice is understood as "an obligation for change, not just rights" (Tschakert & Machado, 2012: 287), engaging with Sen's (1999) concept of development as freedom and agency to lead lives of dignity. This question is explored in Chapter Seven.

An Embedded Case Study in Bagerhat

These research questions were examined using an embedded case study methodology, focusing on the Bagerhat District[1] of Southwest Bangladesh (see Figure 1.1). This site was selected based on documented exposure of environmental hazards, pervasive gendered inequalities, and the presence of a number of active NGOs. Around 36 per cent of people in Bagerhat are involved with agriculture as their main livelihood (Adaptation and Mitigation Knowledge Network, 2015), including rice, wheat and jute (Bangladesh Bureau of Statistics, 2012), and the local economy is dominated by shrimp farming and agriculture. The area is prone to extreme weather, including storms, cyclones and tidal surge flooding (Ali, 2006), and there is preliminary evidence of climate change (Fakirhat DMC, 2014), in terms of increased temperatures and changes in rainfall patterns. The risks associated with climate change in Bagerhat sit alongside a range of environmental issues that have emerged from political interventions and agricultural trends. The Farakka Barrage, a dam in India blocking rivers that flow into Western Bangladesh, has had a deep impact on the hydrology

[1] Administrative areas in Bangladesh consist of: Division → District → Upazila/Sub-district → Union → Ward → Village

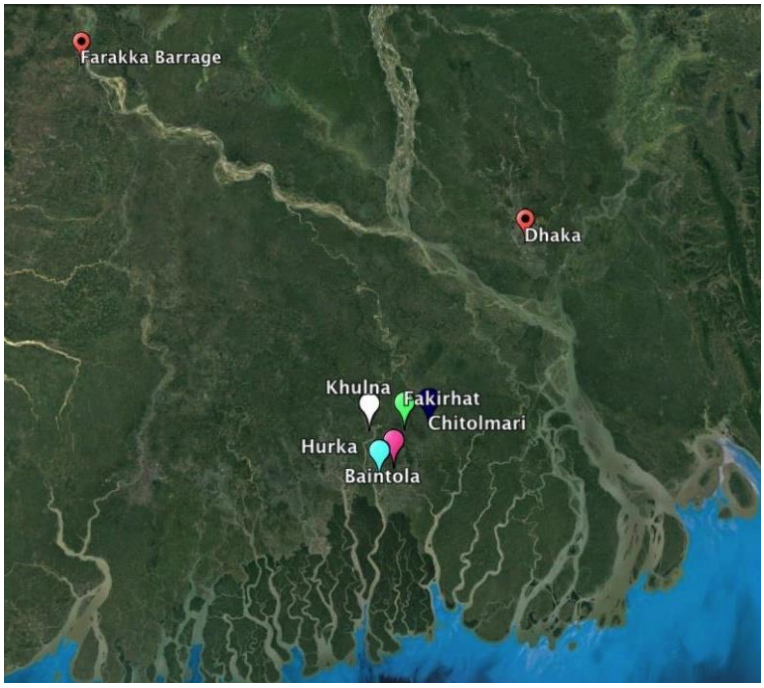
of the region (see Figure 1.2 below for map). Increasing salinity is widely documented as a major environmental challenge in the region, with a saline front stretching as far as 100 kilometres inland (Khan et al., 2011a).

Four village communities in Bagerhat were identified as embedded cases, based on their historical exposure to environmental changes, key livelihoods, evidence of adaptation, and the willingness of the community to take part in research. The four villages are referred to here by the name of the Union area they are in: Baintola, Hurka, Chitolmari and Fakirhat. Figure 1.2 shows a map of the case study villages.

Figure 1.1: District Map of Bangladesh

***S**ource: Local Government Engineering Division (2017a)*

Figure 1.2: Map of Field Sites



Source: Google Maps

With the support of a research assistant, Naoshin Jahan, I worked in Baintola, Hurka, Chitolmari and Fakirhat over a total of six months, in 2014, 2015, and 2016. We spoke with women and men living and working in and around the villages, including farmers, teachers, health professionals and local NGO staff, with ages ranging from early twenties to late seventies. We observed people at work on their farms and in their homes (see Image 1.1), and discussed their livelihoods, food and water security, and the changes they had observed in their environments and communities. To do this, we used mixed qualitative methods, informed by feminist and participatory approaches, including interviews, focus groups and participatory tools. This ground-level work was supported by interviews with representatives from institutions, including local and national government, universities and NGOs, to provide insight into macro-level issues around governance and policy.

Image 1.1: Nirad in Fakirhat Shows us his Gher (Shrimp Pond)

Source: Author

Original Contribution

This research contributes to the growing body of sociological scholarship examining the social impacts of climate change, the causes of vulnerability and responses in terms of adaptation and social justice. There has been limited empirical work examining the capacity for adaptation to be transformative, and this work aims to open suggestions for research and practice to consider the pathways for transformative adaptation, as well as contributing to growing critiques regarding adaptation. The initiatives observed in the field were failing to address underlying causes of vulnerability, were largely small-scale and individual in nature, and were at times drawing communities further into practices that had created environmental damage. These findings suggests the need for new approaches to adaptation, critiquing much of the established literature and policy on climate change in Bangladesh.

The thesis also makes an original contribution to understandings around gender and climate change from a feminist perspective, by addressing the key theoretical limitations highlighted by Resurrección (2011) and others. Much of the gender and climate literature has taken an uncritical, homogenising and generalising approach to understanding gender (Resurrección, 2011), vulnerability and exposed geographies. Conceptualising gender as a socio-ecological process

(Sultana, 2009) has allowed for dynamic explorations of gendered roles, responsibilities and entitlements. The adaptation initiatives observed were seen to be opening micro opportunities for reconfiguring gendered power relations, as both women and men 'inhabited' or 'resisted' (Mahmood, 2005) established gendered norms. Such findings highlight the dynamic nature of gender, as well as the challenges in achieving gender equality.

In addition, this research contributes feminist political ecology methodologies. Combining a critical realist approach, informed by feminist political ecology, allowed for an expansion of an 'ecosociology' methodology, by situating the environment as part of the social (Stevens, 2012), and focusing analysis on underlying causal mechanisms that underpin vulnerability. Such a methodological approach encourages examination of the ecological and the social, often imbalanced in sociological literature on adaptation. In particular, using a political ecology approach to examining exposure and sensitivity reveals the underlying political causes of environmental change.

Overview of Thesis

Chapter Two provides an overview of the key theories that guide the study, including adaptive capacity vulnerability theory, gender and gender relations, and transformational adaptation. I explore the theoretical and empirical links between gender, environmental change, and the key critiques of gender and environment literature. I also explore the concept of adaptation, adaptation governance, and the gendered implications of adaptation. In particular, I expand on a gender justice and transformational approach to adaptation. In doing so, I aim to develop a feminist political ecology approach to understanding environmental change, whereby understandings of the underlying, structural and social causes of vulnerability open opportunities for transformation of both environments and social structures.

Chapter Three presents the methodological approach taken in this thesis. The research questions require a methodology that examines both material and environmental contexts, alongside social constructions of gender, class and governance. A critical realist methodology, informed by feminist political ecology approaches to research, led to the creation of a qualitative, case-study based approach. Fieldwork was carried out in four villages in Southwest Bangladesh, as outlined above, using mixed qualitative methods. In addition, the ethical considerations associated with cross-cultural research are also discussed.

Chapter Four examines the context of Bangladesh, reviewing literature on the political and ecological context of the Southwest, including governance, environmental context and gender relations. This sets the village case studies in a broader institutional and governance setting, providing a broader historical and political context to the question of adaptive capacity. In particular, this chapter highlights the complexity and political nature of environmental change in Southwest Bangladesh, the challenges associated with climate and adaptation governance, and the enduring challenges of gender inequality.

Chapter Five applies the adaptive capacities vulnerability framework to better understanding environmental change in Southwest Bangladesh, in terms of the exposure and sensitivity of the case study communities. This chapter firstly investigates the environmental conditions and changes experienced by people in each of the case study villages, investigating the underlying causes of these changes, and the impacts that these changes have had on people's food security, agricultural livelihoods and wellbeing. Evidence of climate change is presented, before situating climate change as a 'magnifier' of other pre-existing environmental changes. In particular, the context of fluctuating salinity and the impacts of a range of political interventions designed to commoditised agriculture in the Southwest – including the Green Revolution, the Blue Revolution and poldering (embankments), are discussed.

Chapter Six explores the sensitivity and adaptive capacity of the case study communities within the context of the environmental changes discussed in Chapter Five. This chapter discusses the ways in which poverty, gender inequality and limits of knowledge have increased the sensitivity of communities to environmental change, while eroding their capacity to respond in proactive and positive ways. Gendered roles and responsibilities are explored in detail, as creating specific gendered vulnerabilities that put women's lives and wellbeing at risk.

Chapter Seven responds to Chapters Five and Six, examining the ways in which adaptation initiatives respond to the vulnerabilities established in the previous chapters. The chapter begins by examining adaptation governance, highlighting significant limitations to positive governance that further create sensitivity and constrain the adaptive capacity of communities. The chapter then examines the range of adaptation initiatives observed in the case study communities. It considers the capacity of these initiatives to address the underlying causes of environmental change, gender inequality, poverty, limits on knowledge and collective action. The limitations of these initiatives are discussed, arguing that many of the initiatives are top-down and technocratic in nature, or small-scale and neoliberal in their situating of resilient and autonomous communities. The chapter

considers the ways in which the scope for gender transformative approaches were limited for women, but this needs to be understood in the context of women's own agency and ambitions, which often reflected their identities in relation to their families.

Chapter Eight provides an overview of the key contributions of this thesis, and the broader implications of the findings with regards to adaptation theory and practice. I present an overview of the vulnerability context being faced by the case study communities, which opens an engagement with the context of transformative adaptation, drawing on the work of Pelling (2011). I discuss the 'recontextualisation' of climate change in Southwest Bangladesh, arguing that the exposure and sensitivity of the case study communities lie at the intersections of global and local politics, and need to be responded to at these multiple levels. I discuss the limitations and opportunities of adaptation, building on work by Carr (2008a; 2008b) and others to consider the ways in which gendered norms are inhabited and resisted in adaptation processes. I consider risks of maladaptation observed in the field, expanding on the work of Tierney (2015) and others in highlighting the risks of adaptation being used as a tool for ongoing commodification and neoliberalisation. Possibilities for a transformative approach to adaptation, which draws on gender justice and collective action are then considered. Finally I reflect on the scope and limitations of the study, and the implications for future research.

Chapter Two: Conceptualising Vulnerability, Gender and Adaptation

Introduction

This thesis examines the ways in which adaptation responses in Southwest Bangladesh respond to embedded social, political and environmental structures. This chapter provides an overview of the key theories that guide the study, including understandings of vulnerability, gender and gender relations, adaptation and justice. I review literature from environmental sociology, feminist and gender studies, development studies, political ecology and agricultural science. In doing so, I aim to develop a feminist political ecology approach to understanding environmental change and experiences thereof, whereby understandings of the underlying structural causes of vulnerability open opportunities for transformation of both environments and social structures.

I begin by presenting an overview of adaptive capacity vulnerability theory, whereby experiences of environmental change are mediated by exposure, sensitivity and adaptive capacity. I then go on to consider the theoretical and empirical links between gender and the environment, with gender as a "socio-spatial-ecological process" (Sultana, 2009: 440) that influences the ways in which men and women interact with natural resources. I then discuss adaptation as a transformative process, with a focus on justice. I present a framework for gender justice within adaptation, discussing a range of theories that situate the need for adaptation to pursue broader social goals, including development frameworks, social justice, climate justice, and gender justice.

Adaptive Capacity Vulnerability Theory

In order to understand adaptation, conceptualisations of vulnerability are needed, in order to understand what communities are responding to. The following section outlines adaptive capacity vulnerability theory, conceptualising vulnerability as a combination of exposure, sensitivity and adaptive capacity.

Vulnerability has been widely debated through the climate, food security and disasters literature (Eriksen & O'Brien, 2007) with various frameworks that focus on external biophysical hazards, political and economic processes, internal social structures and relationships between communities and environments (Füssel, 2007; McLaughlin & Dietz, 2008). Risk-hazard approaches, developed within engineering and economy fields, have focused on the relationship between the severity of a hazard, and response in terms of damage and biophysical responses (Füssel, 2007). Such approaches are less well applied to people and communities, for whom vulnerability is more than simply exposure to hazards, but lies rather in the interactions between hazards and socioeconomic factors (Füssel, 2007). Political economy approaches have been useful in examining the impacts of class and entitlements (McLaughlin & Dietz, 2008). Missing from such conceptions is an understanding of the ways in which natural environments can influence social conditions, suggesting the need for an integrated, political ecology approach, which looks at the interactions within and between people and environments and broader political economies, as well key internal and place-based factors, including agency, capabilities and capacity.

Adaptive capacity vulnerability theory is well established within climate adaptation literature, although limited in its empirical application. This framework captures both environmental and social characteristics, with vulnerability conceptualised as a combination of exposure and sensitivity to external environmental hazards, and adaptive capacity, which describes social factors that influence the scope for action and response. This conceptualisation is drawn from work by Pelling (2011), Blaikie et al. (2003), Füssel & Klein (2006), the IPCC (2008), Adger and Kelly (1999) and Preston and Stafford-Smith (2009). Füssel & Klein (2006: 306), for example, discuss vulnerability as an "integrated measure", prominent within global climate change literature, whereby vulnerability includes both external climate variations, and internal social determinants. Blaikie et al. (2003: 11) define vulnerability as "the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard", capturing key factors including class, gender and occupation. As Wisner et al. (2003: 7) argue, "vulnerability is generated by social, economic and political processes that influence how hazards affect people in varying ways and with differing intensities". Such an approach reinforces the 'social' nature of climate change, environmental change and disasters, calling for often radical, or transformative solutions (Wisner et al. 2003), given that a return to pre-existing conditions is neither desirable, nor possible (Mustafa, 2003). Pouliotte, Smit and

Westerhoff (2009), Cinner et al. (2015) and others have applied similar models, but empirical work is limited. Figure 2.1 presents the model for adaptive capacity vulnerability theory.

Figure 2.1: Model of vulnerability

Source: Adapted from Pelling (2011) and Preston and Stafford-Smith (2009)

Exposure refers to a community's suseptability to climate and environmental changes (Pouliotte et al., 2009; Preston & Stafford-Smith, 2009), the likelihood of a system "physically being in harms way" (Ahsan & Warner, 2014: 33) of climate and environmental hazards. This includes factors such as geographical location – in the case of cyclones, for example, proximity to the cost is a key factor in exposure (Akter & Mallick, 2013), while migration can reduce exposure (Füssel & Klein, 2006). Pouliotte et al. (2009) give the example of houses and fields being located and organised in ways that make them susceptible to flooding. Despite Füssel's (2007) insights regarding the need for an integrated political ecology approach to vulnerability, many studies that utilise an adaptive capacity framework focus more so on intrinsic social factors, with less attention to extrinsic social factors, or critical examination of environmental changes. While Preston and Stafford-Smith (2009) write about exposure in relation to natural climate variability, as well as changing risks over time, missing from much adaptive capacity analysis is a comprehensive understanding of the underlying causes of environmental changes, enbedding environmental risks and hazards in political and social contexts. Conceptualisations of adaptation require an understanding of where hazards have come from and why. As such, exposure needs to be conceptualised as a geographic as well as a social and political process. Chater Five applies these ideas within the case study communities.

Sensitivity describes the likelihood of a system being negatively affected by environmental hazards (Adger, 2006). With regards to climate change, community sensitivity is often

conceptualised in terms of the interactions between livelihoods and natural resources – sensitive communities are often reliant on exposed natural resources, or have suffered loss from environmental changes in the past (Ahsan & Warner, 2014). Those communities that rely heavily on natural resources are often more sensitive to environmental changes than those with diversifed livelihoods (Adger, 2006). O'Brien et al. (2004), working in India, have calculated climate sensitivity in terms of the degree to which a community is reliant on monsoon rains. Khan (2010) describes the ways in which poorer communities are more likely to be situated in degraded or exposed locations more prone to natural disasters. Structural inequalities can lead to people living in areas that are simultaneously environmentally exposed, but rich in natural resources that supports livelihoods (Alam, Asad, & Parvin, 2015). While Ahsan and Warner (2014) classify access to cyclone shelters and warning systems in terms of exposure, these factors are better classified in terms of sensitivity – exposure refers to external hazards, while sensitivity refers to the interface between environments and communities. In addition, roles and responsibilities within communities and livelihoods can lead to differentiated interactions with natural environments, and thus differentiated sensitivities. As outlined later, women's roles and responsibilities regarding caring work, and the provision of food, water and fuel, can increase their sensitivity in terms of mortality and increased workloads in the face of environmental changes. Chapter Five also explores the exposure and sensitivity of affected communities.

Adaptive capacity, the third factor in the vulnerability model, describes the ability of a group or individual to understand and respond to risks and hazards, and make adjustments with regards to exposure and sensitivity, capturing intrinsic, social factors. The IPCC defines adaptive capacity as "the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences" (in Preston & Stafford-Smith, 2009: 13). Ensor et al. (2015) describe adaptive capacity as the ability for people to make deliberate responses and changes in complex social-ecological systems. Key characteristics within adaptive capacity are broad, however a wide body of literature draws attention to the ways in which social, political and institutional categories intersect to influence people's capacities and entitlements. In synthesising this literature, I focus on four key themes: poverty, gender inequality, knowledge, and institutional settings.

Poverty, as Adger and Kelly (1999) write, is an important factor in vulnerability, and can be conceptualised as class, lack of access to resources and a lack of entitlements and capabilities. The concept of capabilities and entitlements, developed by Sen (1999), Nussbaum (2002) and others, evolves from the premise of the goal of development being the acheivement of agency, and the capacity for people to lives lives of dignity. Rather than conceptualising development in terms of GDP, or poverty solely in terms of income, Sen (1999: 18) argues that we should focus on free agency, and the 'capability' for people to enjoy social, political and economic freedoms; the capability of people "to lead the kinds of lives they value". As Nussbaum (2002) and others argue, this includes political and material rights. In the context of environmental changes and disasters, people's access, entitlements and abilities can be contrained, and even moreso where gendered inequalities already exist (Sultana, 2011). In the context of cliamte change, those experiencing poverty are often more likely to be vulnerable, while climate change is likely to exacerbate poverty (Leichenko & Silva, 2014). Tschakert (2016) conceptualises poverty as uneven power relations – rather than focusing on poverty and poor people, there is a need to focus on the processes that make people vulnerable, including strucutral relations and political contexts. Tschakert (2016) suggests an analytical approach that looks beyond income alone, considering multiple and at times intersecting forms of poverty, including analytical frameworks that consider capabilities and processes of social exclusion. In terms of adaptive capacity, poverty constrains people's ability to invest to alleviate risks and constraining opportunities, but also contributes to sensitivity. Leichenko and Silva (2014) discuss the links between poverty and adaptive capacity, with poor people having fewer resources needed to adapt, stressing the risks that badly managed adaptation can have on poor communities, and the ways in which typical neo-classical approaches to poverty reduction can further undermine environmental conditions (for example, through the commodification of agriculture). Inequality also undermines the capacity for collective action – Adger (2014) and others (Hafiza & Neelormi, 2015; Tompkins & Adger, 2004) argue that collective action and social capital are key factors in adaptation and natural resource management, speaking to the capacity for the interdependence of community members, institutions and environments. There is a need for critical examination of the connections between poverty and vulnerability – as Arora-Jonsson (2011) argues, while poverty can lead to vulnerability, and climate change can perpetuate vulnerability, there is no universal correlation. Rather, it is a combination of factors, including lack of access and capabilities, limited options for diversification, failed development polities, degradation of environments,

and negative outcomes of capitalism and globalisation (Leichenko & Silva, 2014). Tschakert (2016: 18) stresses that "the poor are not equally poor", and understandings of underlying factors are needed in the pursuit of just adaptation.

Gender inequality, as detailed in the next section, emerges as a key dimension inhibiting adaptive capacity, and contributing to vulnerbaility for both marginalised individuals, and broader communities. Gender has particular impacts on people entitlements and capabilities in different contexts – as Nussbaum (2002: 1 & 3) writes, "unequal social and political circumstances give women unequal human capabilities" and "when poverty combines with gender inequality, the result is acute failure of central human capabilities". Kabeer (2011) stresses that for women in Bangladesh, entitlements are embedded not only in gender and class relations, but also within family relations. Poor women in rural areas can face inequality in accessing land, education and fairly paid work. In the wake of natural disasters, poor women can face increased risk of death (Tschakert, 2016). Men, too, face differentiated risks in the face of climate change – Alston and Kent (2008) outline the particular mental health burdens faced by men farmers in drought affected parts of Australia, demonstrating how hegemonic mascultity influences men's identity. In the below section, I draw on feminist political ecology to outline the ways in which gender, in concert with poverty, geography and livelihoods, can influence individual and community vulnerability.

Knowledge emerges as a key factor in adaptive capacity. This includes both access to knowledge, and the institutional environments within which local knowledge is valued and shared. Akter and Mallick (2013) include hazard recognition as a key factor in adaptive capacity. Alam et al. (2015) identified significant gaps in knowledge and understanding of climate change among cyclone-affected communities in Khulna, with indigenous knowledge systems failing to predict the scale of the disaster. Brooks et al. (2005) identify literacy as a key factor in building adaptive capacity, arguing that aware populations are more able to engage in political processes to pursue their rights, and accountability from governments. As argued throughout climate change and adaptation literature, local knowledge needs to be incorporated into adaptation approaches, improving the capacity of communities to make informed decisions (Rahman & Alam, 2016). Much of the gender, development, and climate change literature has also stressed the importance of incorporating women's knowledge into adaptation processes, policy and decision-making, highlighting the unique bodies of knowledge developed in gendered roles and responsibilities (for example, see Oakley &

Momsen, 2007), as well as the importance of procedural justice (see below). As such, knowledge, both in terms of communities having knowledge, and their knowledge being included in wider processes, is a key factor for adaptive capacity.

Institutional and governance settings mediate local level entitlements, capacities and inequalities mentioned above. Entitlements are formed, distributed and contested within institutional settings (Adger & Kelly, 1999; Adger, 2001) and political decisions and processes can contribute to environmental changes and degradation that particularly impact poorer communities (Sultana, 2009). The development of the Farakka Barrage Dam is a key example, and as discussed further in Chapter Four, a range of environmental changes and risks in the Southwest are linked with agricultural and policy decisions. Examinations of governance systems also offer clues as to processes that can help to encourage adaptive capacity and transformative adaptation. Schlosberg's (2012: 449) research on climate justice has stressed the importance of "recognition" of groups affected by climate change, arguing that injustice stems from a lack of recognition and unequal social and political status given to different groups. Eriksen et al. (2011: 14) argue that affected groups need to be involved and represented throughout decision-making processes, to ensure 'procedural justice' (Thomas & Twyman, 2005), which Brisley et al. (2012: 5) describe as "empowering communities to be involved in decision-making by overcoming a lack of social capital and institutional barriers". Lebel et al.'s (2006) research looked at governance systems around contested ecosystems in developed and developing countries. Injustices arise from repressive social structures and power inequalities, and there is a central role for governments to pursue social justice and mediate distributions or 'goods' and 'bads' (Lebel et al., 2006). They found that diverse participation and deliberation, flexible systems of governance and accountability were important in fostering ecosystem resilience and livelihoods (Lebel et al., 2006). Engle and Lemos's (2010) work in Brazil examined governance qualities that contributed to adaptive capacity in the context of water management and drought. They found that in many areas, higher levels of representation and participation delivered more flexible and adaptive governance (Engle & Lemos, 2010). Brooks et al. (2005) argue that effectiveness and stability of governance processes, but also the capacity for communities to influence political processes, are central to adaptive capacity.

Neoliberal governance also needs to be interrogated in terms of the capacity of such shifts to engender resilience or vulnerability. Neoliberal influences in natural resource management

and governance are typically characterised by devolution of responsibilities to local communities, and privatisation and commodification of resources (Harris, 2009). Harris (2009) for example, highlights efforts to engage women in natural resource management, which can be seen as a way to "divest responsibility from state management, or shift responsibility or blame to women and other marginalized members of society" (Harris, 2009: 400). Tierney (2015: 1333-4) describes the "neoliberalisation" of resilience, with a de-emphasis on the role of governments in addressing community wellbeing, and away from the consideration of structural issues that create vulnerability, towards the creation of resilient individuals, who are expected to turn risk into opportunity at the expense of collective action. Such processes help explain the targeting of women in adaptation processes, and discourses that cast women as "chief victim-and-caretaker" in the context of vulnerabilities and adaptation (Resurrección, 2011: 3), discussed further below. In addition, a central focus on the grassroots as the central site of adaptation fails to recognise limitations in institutional and resource support, and the limits of community responses (Alam et al., 2015).

Based on the above review, I have approached the field with the following framework of vulnerability, outlined in Table 2.1.

Table 2.1: Vulnerability Determinants

Vulnerability Determinants	**Exposure**	**Sensitivity**	**Adaptive Capacity**
	• Risk and experience of environmental and climate hazards	• Impact on lives, agricultural livelihoods and wellbeing • Geographic inequalities	• Poverty and inequality • Gender Inequality • Knowledge • Institutional and governance settings

Source: Adapted by author from Pelling (2011) and Preston and Stafford-Smith (2009)

This adaptive capacity approach to vulnerability is valuable for a number of reasons. Firstly, vulnerability to natural disasters and environmental changes are understood as a social process. As Cannon and Müller-Mahn (2010: 622) argue, "disasters are socially constructed events: the product of the impact of a natural hazard on people whose vulnerability has been created by social, economic and political conditions". Power relations, as such, are central to processes of adaptation. The above framework is useful in understanding the social factors that contribute to vulnerability, and the connections between livelihoods, wellbeing, natural

resources, and adaptation. Firstly, this framework works with insights from feminist political ecology scholarship, which draw attention to interactions between gendered power structures and the natural environment. Secondly, such approaches acknowledge that changes to biophysical conditions are not sufficient alone for addressing vulnerability (Preston & Stafford-Smith, 2009), and adaptation needs to go beyond biophysical responses. Thirdly, this approach suggests the need for adaptation processes that go beyond 'returning' systems to pre-existing statuses, resilience or equilibrium. As Cannon and Müller-Mahn (2010: 623) write, those people adapting to climate change are unlikely to have been resilient "under existing conditions, let alone those of climate change".

Feminist Political Ecology: Connecting Gender and Climate Change

To elaborate upon the interactions between gender, environmental change and vulnerability, the following section establishes a feminist political ecology framework for understanding climate change. A wide body of environmental sociology, development literature and political ecology has sought to highlight instances of environmental injustice, and the increased vulnerability faced by politically and economically marginalised groups and developing nations, as a result of poverty, lack of social safety nets and high reliance on natural resources (Buckingham & Kulcur, 2009; Thomas & Twyman, 2005). Political ecology scholarship opens a space for examining how social power relations influence and interact with natural resources (Truelove, 2011), and the interface between politics and the environment (Forsyth, 2001).

Political ecology emerged as a branch of geography and environmental sociology in the 1970s, drawing upon structural Marxist perspectives which link environmental degradation to modes of production, capitalism, class structures and social marginalisation (Forsyth, 2008), at both local and global scales (Biersack, 2006), drawing attention to the ways in which marginality is created via global material relations (Robbins, 2004). Watts (2015: 34) argues that "political ecology had as its reference point what I would call regimes of accumulation...that shaped how resources, environments, and perturbations might be managed and governed". As outlined futher in Chapter Four, political ecology has also undergone a 'rematerialisation' in response to the decades of post-structuralism, considering embodiment, agency, and the ways in which social processes are embedded in environments

and socio-ecological relations (Bakker & Bridge, 2006). Following from this analysis, the key concept considered here, vulnerability, is not a natural process; rather, biophysical hazards and changes interact with social, cultural, political and economic power relations, including gender, to influence people's experiences and responses to environmental changes (Adger et al., 2003; Ribot, 2010).

Much development and feminist literature, and feminist political ecology (FPE) has drawn attention to the role of gender in creating and augmenting vulnerability to environmental change (Cannon, 2002; Demetriades & Esplen, 2010). The field has built on traditions in political ecology, which has focused moreso on class as a key marker of social-political ecology, to incorporate intersectional analyses that look to gender, class and ethnicity (Hanson & Buechler, 2015). In addition, feminist political ecology approaches have sought to move away from the more essentialising arguments of previous gender and environment theorising, including ecofeminist theories, to look towards social configurations of labour, decision making, access to resources and spaces, and capabilities to explain gendered differences. In particular, recent work has focused women's vulnerability as a result of poverty, as well as and gendered divisions of labour and resource use that de-value women's work and expose women to environmental challenges (Dankelman, 2002; MacGregor, 2010). As Lahiri-Dutt (2012: 112) writes, "human relationship with the environment is not gender-neutral; rural women in developing countries interact more directly with their local resource bases and are disproportionately affected adversely by degradation of these resources". Feminist political ecologists have also argued that "not all women are equally vulnerable" (Sultana, 2014: 6). Rather, vulnerability emerges in the context of power relations (Arora-Jonsson, 2011) and intersects with class, caste, ethnicity, age, education and religion (Harris, 2009; Nightingale, 2011; Sultana, 2014). More recently, researchers have begun to apply these ideas to understand the role that gender plays in processes of climate change (Dankelman, 2002). Climate change is understood to have uneven impacts, with gender, along with class and geography, emerging as a key driver of these differential impacts and outcomes (Sultana, 2014). This literature has sought to highlight that climate change impacts are not gender-neutral, but rather, have gender-differentiated causes and effects (MacGregor, 2009; Ribot, 2010). This is discussed in more detail below (see section titled 'Gender and Climate Change').

I draw upon feminist political ecology and development theory to define gender as "the socially acquired notions of masculinity and femininity by which men and women are identified" (Momsen, 2010: 10). As MacGregor (2010: 224) describes, gender should not be seen as a "synonym for women", but as "hegemonic constructions of masculinity and femininity". As Nightingale (2011: 153) writes, gendered bodies are a product of power in socio-natural networks, and material environments and spaces are intertwined with bodies, producing social difference, and impacting on ecologies (Nightingale, 2011). The recognition of gender as a social construct means that gender is neither binary, nor inflexible, and roles and relations are "dynamic and context-specific" (Dankelman, 2010: 10), and interact with historical and political processes (Momsen, 2010). As a social construct – an underlying structure that occupies an ontologically 'real'[2] space – gender norms and expectations are enduring, and can be known through historical analysis, and qualitative engagements.

While the field of feminist political ecology has historically been focused on highlighting inequality and injustice, the field is now opening more clearly to articulating alternatives to neoliberalism and "the inequities and unliveable socio-natures that these trajectories too often engender" (Harris, 2015: 179). This research contributes to the field of feminist political ecology, by looking not only at the manifestations of gendered power relations, but exploring the scope and mechanisms for change. As Hanson and Beuchler (2015: 9) write, "environmental justice frameworks have also strengthened the links of critical feminist political ecological analyses to their direct material and policy implications". New environmental, social and political contexts can also lead to re-negotiations of gendered identities (Sultana, 2009). Gendered identities and subjectivities are constructed, produced and negotiated, in part, through everyday environmental practices, including divisions of labour, norms and rights regarding water, land and food, and access to gendered spaces (Sultana, 2009). Empirical research on this process of change, and the intersections between historical and current neoliberal forces, local and regional political ecologies and the implications for gender relations, is a key contribution of this thesis.

[2] See Chapter Three for a further discussion regarding the ontological nature of gender.

Gender, Food and Agriculture

Food emerges as a key point at which people and environments meet (Nightingale, 2011), and growing, preparing, eating, and trading food are important points around which gendered subjectivities are created. Allen and Sachs (2007) present a framework for examining gender relations around food, which provides useful insights into power relations within and around agricultural communities. They define gendered engagement with food via three domains: 1) socio-cultural (household food work); 2) material (income generating food work); and 3) corporeal (individual food security). The *socio-cultural domain* captures home-based food work for families (Allen & Sachs, 2007). Allen and Sachs (2007) argue that while women's food provisioning roles create spaces for women's agency and identity – as tools for communicating identity, culture and class, and connection with family and friends – these roles can also create unequal power relations between women and other family members, by subjecting women to significant mental and physical unpaid labour, and positioning women as subservient within the household (Allen & Sachs, 2007). The *material domain* considers gender relations with regards to material production, paid work, and political economies of food and agriculture. This includes access and entitlements to material and natural resources, including land, knowledge, and fair wages. The feminisation of agriculture is a key theme here. Economic transitions, including urbanisation and industrialisation has seen men move away from agriculture towards labour on larger farms, or work in other sectors. As such, the role of women in agriculture has increased, described as the "gendered nature of agrarian transition"; this trend is particularly pronounced in Bangladesh (De Schutter, 2013: 4). Gender roles have also changes dramatically by processes of economic development – Momsen (2010) describes the advent of modern agriculture, which has altered divisions of labour and often excluded women from ownership of land. The *corporeal domain* captures women's relationship to food in terms of their health, bodies and identities. This captures, for example, the reported tendency for women to forgo food in times of stress to protect their children (Alston & Akhter, 2016), or reports of gendered bias in feeding sons and daughters (Chen, Huq, & D'Souza, 1981). As Alston and Akhter (2016) argue, understandings of the food security impacts of climate change are better conceptualised at the micro and household level, as opposed to looking at food production, given the likelihood of intra-household inequities in distribution.

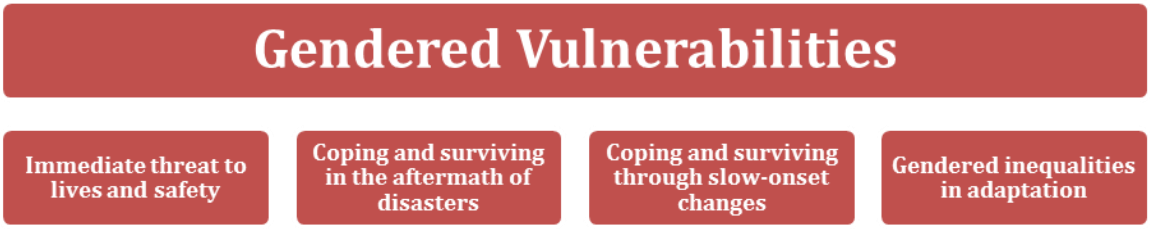
This framework captures livelihoods, as well as capabilities and entitlements, and draws attention to gendered relationships, gendered roles, and power in relations to the environment. In addition, the framework draws attention to broader political economic forces influencing micro practices.

Gender, Climate Change and Vulnerability

I elaborate here on the growing body of international literature considering the ways in which gender and the surrounding institutions and structures influence vulnerability to climate change (Alston, 2015; Dankelman, 2002; Enarson & Meyreles, 2004; Enarson, 2012; MacGregor, 2010). Drawing out of longer traditions in development and disaster studies and feminist literature (Enarson & Meyreles, 2004), this literature considers uneven and uncertain impacts of climate change (Sultana, 2010), with gender and class inequalities influencing vulnerability to changes and hazards (Sultana, 2011). While not always the case, in Bangladesh there is a strong correlation between poverty, gender and vulnerability, resulting in "gendered powerlessness and suffering" (Sultana, 2011: 46). The result is differential impacts for the rich and poor, men and women, and often worse outcomes for poor women (MacGregor, 2010).

A significant body of work, from development and disaster risk reduction literature in particular, has worked to document the greater vulnerability faced by women in the face of climate change and natural disasters (see Enarson & Meyreles, 2004). This includes: 1) the immediate risk to women's lives during natural disasters, 2) the challenges faced by women in the aftermath of disasters, 3) challenges faced during the process of slow-onset changes, and 4) challenges faced in processes of coping and adaptation (see Figure 2.2). Women's vulnerability emerges from underlying gendered power relations that pre-exist environmental changes (Egert, 2014; Fisher, 2010) and the literature highlights a number of key mechanisms by which this heightened vulnerability emerges. Firstly, women's roles and responsibilities are seen as leaving them particularly exposed and sensitive to environmental changes; secondly, experiences of poverty leave women with limited capacity to adapt; thirdly, political and social discrimination leave women with limited voice in decision-making processes; finally, gendered demonstrations of masculinity put women at risk of violence and marginalisation.

Figure 2.2: Gendered Vulnerabilities



Source: Author

In terms of immediate threats to lives and safety, as Egert (2014) writes, women face disproportionate mortality rates and risks of sexual abuse and violence. Neumayer & Plumper (2007), examining 141 countries from 1981 to 2002, found that more women than men die during natural disasters. Some research found evidence of women and children waiting at home for their husbands to return, to make decisions about whether to evacuate (Habiba et al., 2013a; WHO, 2002). Importantly, these mortality rates need to be examined in the context of intersections with class, acknowledging that these mortality rates apply more so to poor women in rural areas (Arora-Jonsson, 2011). There is evidence of increased incidence of gender-based violence (Enarson, 2012; Fisher, 2010). Fisher (2010) argues that the contextual conditions in post-disaster communities create 'triggers' in situations where GBV and subjugation of women are already occuring. Poor conditions within disaster accomodation can exacerbate these issues also. The broader context of women's vulnerability, such as economic poverty and social dislocation, create a contextual environment within which violence can occur (Fisher, 2010). Other authors have drawn on Connell's theory of 'hegemonic masculinity', arguing that men seek to re-assert gender and power in the context of threat and disruptions, exhibiting "masculine overcompensation" (Zara, Weiss, & Parkinson 2013: 18).

In the aftermath of disasters, women have been found to face acute, differential challenges, particularly in terms of domestic and care work (Enarson, 2012). Those women whose husbands die, become injured, migrate or flee, find themselves with increased responsibilities and workloads (Egert, 2014; WHO, 2002). Dankelman et al. (2008) and Habiba et al. (2013a) report evidence of women's increased workloads following disasters, including having to work harder to secure natural resources, including water. Economic hardship can also leave women susceptible to risky livelihood options, including prostitution (Fisher, 2010). Women also face a range of health consequences as a result of environmental changes after disasters

or slow-onset changes. A significant body of research has reported on the health impacts faced by pregnant women having to drink or bath in salty water, including seasonal hypertension and pre-eclampsia, with negative implications for both mothers and their children (Khan et al., 2011a). Buechler (2009) talks about loss of livelihoods, loss of access to productive land, limited access to resources to enact adaptation, as well as the challenges associated with men's migration. There is also evidence of gendered bias in processes of adaptation and development and implementation of policy (Sultana, 2014), which is discussed further below.

Critiques of the Gender and Climate Literature

Carr and Thompson (2014: 183) highlight a number of key critiques of much of the gender, climate and adaptation literature. Firstly, much of this literature has analysed gender as a binary concept, overlooking contemporary feminist theory and the importance of intersections between gender and other social categories. Secondly, there has been insufficient consideration of the ways in which gender relations will be altered and re-negotiated in response to environmental changes – Carr and Thompson (2014) call on the work of Alston and Whittenbury (2013), who argue that environmental challenges are leading to re-negotiations of gender relations found in farming settings, with women engaging in more off-farm work. Such findings fit within feminist-ecological theories that situate gender as a process of negotiation between individuals, communities and environments.

A full understanding of the gendered impacts of climate change requires considering the ways in which the interactions between gendered norms and changing environments affects both women and men. However, this literature is scarce. Broader gender based analysis, such as those conducted by Alston (2013), highlight the differentiated impacts on both men and women – Alston's (2013) works on Australian farmers facing drought found that men were prone to poor mental health and social isolation, while women were overburdening themselves with on-farm, off-farm and community work. Alston and Kent (2008) draw on ideas around hegemonic masculinity to understand the prevalence of mental health issues among male farmers experiencing drought in Australia. Drought was leading to increased workloads for both men and women, and challenging men's identities as farmers and leading to feelings of powerlessness (Alston & Kent, 2008).

There are also risks associated with the assumption that being a woman leads to vulnerability, which call for more nuanced considerations of the ways in which gender relations function at a local level. Arora-Jonsson (2011) argues that much gender and climate literature has presented un-reflexive representations of women as vulnerable drawing in particular on un-critiqued arguments on the links between women, poverty and vulnerability. As Arora-Jonsson (2011: 746) writes, "There is a need to separate being poor from being women or the generalization that one often glides into – that all women are poor and that the poor are always more vulnerable".

A thorough understanding of gender relations also requires consideration of the intersections with other key subjectivities, such as class, and within households. Such a perspective breaks down narratives and discourses of gender relations as static, and notions of 'women' as a "unified category" (Allen and Sachs, 2007). Gender "gains meaning" through interactions with other "markers of social difference" including age, income and ethnicity (Carr & Thompson, 2014: 187) and as Allen and Sachs (2007: 4) write, "intersections of gender, race, ethnicity, and class define who does what in the food systems and under what conditions". Feminist political ecologists have also stressed vulnerability needs to be understood in the context of other power relations and intersections of gender with class, caste, ethnicity, age, education and religion (Arora-Jonsson, 2011; Harris, 2009; Nightingale, 2011; Sultana, 2014). In Bangladesh, for example, such a perspective reminds us that the feminisation of agriculture has been taken up by poorer women in rural areas, while the country's burgeoning garments industry is being driven by young women, many of whom are migrating to cities from rural areas. These intersections provide insight into the ways in which gender manifests with regards to other important social categories, in relations to geographies and environments, and the influences that these intersections have on processes of change. In addition, such insights help to break down unhelpful binaries between "men" and "women" as unified, unchanging categories (Carr & Thompson, 2014: 183).

Throughout this thesis, the findings presented are relevant to poor women in rural, agricultural areas and while the theoretical findings may apply to women in other contexts, care should be taken to ensure that 'woman-ness' and class are not conflated with vulnerability. Rather, I focus on how specific manifestations of gender shape inequities in the experience of environmental changes. Including adaptation, rather than a focus on vulnerability alone, also helps to highlight the dynamic nature of environments, gender

identities and livelihoods. A key contribution of this thesis is to expand on understandings of these gendered impacts of environmental change and adaptation, drawing on understandings of gender that include relationality between men and women, and the ways in which food-related tasks constitute and re-constitute gendered norms.

Understanding Adaptation

This study fits within a growing literature that situates climate change, and climate change adaptation, social issue, with gender as a key concern, beyond the technocratic and managerial discourses (Tschakert & Machado, 2012). The IPCC define adaptation as a process of making adjustments within "ecological, social and economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts in order to alleviate adverse impacts of change or take advantage of new opportunities" (in Adger, Arnell, & Tompkins, 2005: 78). Political ecology literature has defined adaptation as "specific actions that individuals or societies take to reduce or minimise the risks posed by a changing climate as well as the broader processes that shape these responses" (Bee, 2014: 4). These definitions have evolved from classical, engineering-based concepts, towards political economy and integrated approaches, which consider both the internal and external factors of a community or ecosystem (Füssel, 2007). Adaptation can be both in response to, or in anticipation of, changes in environmental conditions, based on economic well-being or safety (Adger et al., 2005), which the IPCC have defined as 'planned' or 'autonomous' adpatation (Forsyth, 2013). As Adger et al. (2005) write, addressing exposure might include mitigation efforts; addressing sensitivity might include improving infrastructure or investing in condition-tolerant crops; while increasing the capacity of a system to deal with changes might include broader efforts to improve wellbeing and access to resources. Some authors describe activities that strengthen adaptive capacity as adaptation in themselves (Adger et al., 2005).

While some literature uses 'coping' and 'adaptation' interchangeably, 'coping' better describes short-term, unsustainable actions, as a result of limited alternatives for survival. Coping strategies are generally brought on by crisis and stress (Alston, 2013), and often result in the degradation of environmental resources (Ambjornsson, 2011) or household assets (Habiba et al. 2013b; Tschakert, 2012). This is closely related to the concept of 'maladaptation', which describes efforts to address vulnerability that ultimately increase the

vulnerability of other groups, geographies or scales (Barnett & O'Neill, 2010). Adaptation implies the availability of a range of choices, and the sustainable use of resources, aimed at long-term livelihood options (Ambjornsson, 2011), transformations of institutions and addressing structural inequalities (Alston, 2013).

Adaptation sits as one of four key responses to climate change, which includes preparation, mitigation, and loss and damage responses. The need for adaptation has been driven by failures in mitigation, given the amount of greenhouse gases already in the atmosphere, and limited progress on mitigation, some degree of warming and environmental change is occurring now and into the future (Ayers & Huq, 2009; Lever-Tracy, 2008). While many argue that the pursuit of adaptation should not replace efforts towards mitigation (although there are argument regarding the detraction of funding, resources and knowledge away from mitigation efforts), there is now a global need to adapt to environmental changes, and assist people in vulnerable environments and occupations (Ayers & Huq, 2009). Loss and damage, conversely, describes the failure of adaptation and mitigation, the "negative effects of climate variability and climate change that people have not been able to cope with or adapt to" (Warner et al., 2012: 20), and represents a new area of focus for researchers, as well as activists from vulnerable and developing countries.

More fundamentally, Watts (2015) and Tierney (2015) have begun to outline the ways in which the concepts of adaptation and resilience have been deployed within a broader neoliberal project. As Watts (2015: 40) argues, "Building resilient systems draws upon the adaptive and self-organizing capacities of the market above all else; resilience dissolves directly into neoliberalism understood as a way of life" – adaptation, as such, becomes "incapable of addressing the radical asymmetries of power" (Watts, 2015: 39). Such insights call for a re-conceptualisation of adaptation as transformation, capable of addressing the "radical asymmetries of power", and allowing for a re-egangement with the roots of political ecology - "power, agency, struggles over access and control of property, labor and the disposition of surpluses" (Watts, 2015: 39 & 35).

Gender and Adaptation

Recognition of the differential impacts that environmental and climate change has on men and women has led to a growing body of academic and development work, situating women as key actors in adaptation processes. However, there are major tensions and challenges in this literature, including with the representations and expectations placed on women as a result.

A growing body of literature and practice considers the role that gender plays in adaptation, drawing evidence regarding the status of women with regards to climate change. Some argue that more attention should be given to women as gatekeepers of local knowledge (Alston, 2014), and catalysts for change (UNEP, 2011). The United Nations Environment Programme (UNEP) for example, describes women as being at the 'frontline' of climate change, central to adaptation as a result of their increased vulnerability, but also as a result of their knowledge, experience and agency with regards to natural resources (UNEP, 2011). CARE International (2010: 3) argues that women are better stewards of household resources, and advocates for a "gender transformative" approach to adaptation. This recognises the gender-differentiated impacts of climate change, and seeks to help women meet their basic rights, which also considers structural issues, women's empowerment and access to resources and opportunities. Neelormi (2010: 120) documents the engagements of women in a community-based adaptation initiative run by CARE Bangladesh (discussed further below), stating that "recognizing that women were especially vulnerable, the project prioritized destitute women, widows, divorced women and women-headed households when selecting participants for the household level activities". These activities followed a 'gender sensitive' approach, seeking to "work within the social and religious taboos" by developing initiatives that allowed women to stay close to home (Neelormi, 2010: 120). Such approaches incorporate important critiques regarding the invisibility of women, and gendered considerations in much development and climate change literature. In addition, much of this literature recognises the structural barriers that women face.

However, this focus on the role of women as responsible for development processes has also attracted criticism. Leach (1992) argues that women are often assumed to limit their activities to care-giving work in the domestic sphere, without consideration of the variation of women's work and the meanings embedded in particular roles. Women's role as 'managers' assumes that women will be willing and able to add the environment to their existing roles

(Leach, 1995 in Momsen, 2010: 111). There are parallels with critiques of eco-feminism and broader women-and-development discourses, which situate women as naturally closer to nature and more environmentally conscious (Arora-Jonsson, 2011). Wilson (2015), exploring microcredit processes in India and Bangladesh, argues that women have been targeted for engagement in microcredit on the assumption that women are better able to invest in their families. Such perspectives overlook why women's attention is focused more so on the private realm, suggesting the need to consider structural issues around the "gendered division of responsibility" (Wilson, 2015: 811). In addition, the targeting of women in environmental projects has been found in some instances to have unintended consequences, such as increasing women's workloads, or perpetuating underlying power relations (Arora-Jonsson, 2011). The risk of 'participatory exclusion (Agrawal, 2001; Sultana, 2009) also emerges, whereby women's active participation remains limited by gendered divisions of labor, social percpations, and local gender and class power relations.

Approaches that target women as the agents of adaptation also run the risk of framing women as "vulnerable and virtuous" (Arora-Jonsson, 2011: 745). Critiques by Arora-Jonsson (2011) and Resurrección (2011, 2013) draw attention to the ways in which static conceptions of gender and vulnerability have cast women as victims of climate change, while also situating women as agents of change. Such generalisations conceal questions regarding why certain people are vulnerable, how gender is created and maintained, the role of institutions, and intersectionality between gender, poverty, class and ecology (Arora-Jonsson 2011). As Resurrección (2013) argues, it might be more valuable to focus on the underlying drivers of gender vulnerability, as opposed to focusing on women's participation by itself, crafting responses that respond to the contextual factors and practices that cause the marginalisation of women and other marginalised groups. In overcoming exclusion, it is not just women's participation that is important, but their capacity to be interactive, engaged participants in local processes (Agrawal, 2001). In a response to these critiques, some literature has begun to consider the capacity of adaptation initiatives to address these underlying issues. There is a growing body of literature documenting evidence of gendered injustices in processes of adaptation and development and implementation of policy (Sultana, 2014).

While literature on the gendered nature of climate change in Bangladesh is plentiful, literature on the gendered nature of adaptation in Bangladesh is limited, with the exception of literature considering the gendered effects of migration (Habiba et al., 2013b; Mallick &

Vogt, 2012), including international and domestic migration, and temporary and seasonal migration (Hadi, 2001). Swapan and Gavin (2011), working in the Southwest, found evidence of migration and occupation shifting as a result of the limited demand for labour in the shrimp industry. Others have considered 'forced migration' as a result of cyclones Aila and Sidr, with disasters resulting in temporary or permanent community displacement (Saha, 2014). Much of this literature has considered the effects that this migration has on women, given that women are often likely to be 'left behind' while their husbands move away. There is evidence of the increased pressure on women in the absence of their husbands, including increased workloads, debt, food insecurity, and sexual harassment (Etzold, Ahmed, Hassan, & Neelormi, 2013; Saha, 2014). Others have attributed men's migration, and the movement of men into non-farm occupations, to the increasing role of women on agriculture (Jaim & Hossain, 2011). Other have linked the experience of women whose husbands migrate to their social connections and family situations, with women seeking to maintain social norms around the expectations places on them (Rashid, 2013), while others have argued that women household heads may have greater mobility (Kabeer, Mahmud, & Tasneem, 2011) and more opportunities for work.

A growing body of empirical work has begun to consider the ways in which existing social norms and practices influence adaptation initiatives. Adger et al. (2009) discuss endogenous limits to adaptation, exploring the ways in which perceptions of risk, knowledge, ethics and culture create limits to the power of adaptation within communities. Carr's (2008) work in Ghana has focused on why particular adaptation initiatives persist, arguing that adaptations that are linked to existing gender roles help to legitimise these adaptations, while re-enforcing gendered roles. The diversified farming initiatives that Carr (2008a) observed in Ghana, where women were left with less land despite engaging in more productive farming, persisted because they mobilised existing, embedded gender roles. As such, adaptation emerges as reactions to risk, "that takes shape under locally specific conditions of uncertainty" (Carr, 2008a: 694). Bee (2013) makes a similar argument, drawing on standpoint theory to draw attention to the role of women's agency in adaptation. Bee's (2013) work in Mexico found that while women had a wide body of knowledge regarding farming, adaptation and the climate, their ability to apply this knowledge was constrained by gendered differentiated access to key resources, including land, and decision-making. Bhattarai, Beilin, and Ford (2015) found evidence of NGOs privileging established gender relations in agricultural adaptations in Nepal, with cash-crop based assistance privileging men. Choudhury, Haque

and Habib's (2016) in the Northwest wetlands of Bangladesh sought to investigate the social factors that constrain the involvement of women in participatory natural resource management work. They find that social class, and prevailing social structures and attitudes regarding women's capacity, knowledge and acceptability, led to women self-excluding from participatory forums. As such, the creation of participatory spaces where women can take part is not enough. Rather, efforts towards gender equality and women's empowerment, across individual, household and community levels, is required (Choudhury et al., 2016). Djoudi and Bockhaus (2011), working in Mali, documented the gendered implications of adaptation efforts, finding both positive and negative outcomes – while women were increasingly undertaking forest-related tasks considered 'male', these changes did not associate with an increase in women's rights, and resulted in increased workloads. However, this feminisation of forest-related tasks suggests opportunities for reduced vulnerability, through diversification of livelihoods.

Such findings suggest that adaptation is embedded within "cultural, political, economic, environmental and developmental contexts" (Wise et al., 2014: 332). Social values, perceptions and social structures can limit adaptation, and alter perceptions of risk (Adger et al., 2009), particularly where adaptations are likely to threaten existing power relations and resource distribution (Shackleton, Ziervogel, Sallu, Gill, & Tschakert, 2015). When prevailing social relations are a key underlying cause of vulnerability, and thus a target for adaptation, change will be difficult to effect (Pelling, 2011).These structures emerge as "historical determinism, path-dependency, and lock-in; they mean future pathways are contingent on historical pathways and difficult to change" (Wise et al., 2014: 332). As Nightingale (2011: 161) writes, "inequalities are constantly shifting and open to reinterpretation, but are also surprisingly resilient to major reconfiguration". Her concept of "resilient contestations" reminds us of the ways in which hierarchies are reproduced, and the ways in which resistance can further entrench subjectivities, rather than subverting them (Nightingale, 2011: 161). As Carr and Thompson (2014: 185) write, adaptations are not simple adjustments to material conditions, but "complex renegotiations" of gender relations that respond to both changing agricultural contexts, and long-standing gendered expectations.

Adaptation as Transformation

What the above review suggests is that without gender justice and transformative objectives, climate change adaptation approaches run the risk of perpetuating the social inequalities that create vulnerability. Much adaptation work and literature does not consider the broader political and policy framework within which people are adapting, and the ways in which regional and national policy settings might be affecting micro level outcomes. In addition, much adaptation work lacks an explicit justice framework that can guide and assess the contribution of adaptation initiatives.

This is where an 'adaptation as transformation' approach can be of use. Adaptive capacity theory draws our attention to social conditions that need to be considered alongside biophysical sensitivity and exposure, when responding to climate change. Climate change provides "a distinct moment of challenge to established values and organizational forms that embody power relations" (Pelling, 2011: 95). This echoes Beck's (2014: 169) concept of "emancipatory catastrophism", and Klein's (2014) concept of the "revolutionary power of climate change". Adaptation needs to address underlying social inequalities as a key focus, triggering processes for in-depth social change. Adaptation as transformation (Pelling, 2011) opens as a space for new social and ecological relationships. This thesis builds on the assumption that, in the context of natural disasters and climate change, existing gendered roles, relations and responsibilities may be tested, altered and stretched, in positive and negative ways (Enarson, 2012; Sultana, 2014). Adaptation can be seen as the creation of new environmental, social and political contexts, with the potential to open opportunities for new subjectivities – new expressions of masculinity and femininity, new expressions of gendered roles and relations, as well as governance and socio-ecological relationships.

Pelling (2011) argues that existing approaches to adaptation can be seen on a spectrum, from resilience, to transition, to transformation. While Hafiza and Neelormi (2015) and others use the term 'resilience' as an outcome of adaptation, Pelling (2011) has devised new terminology to distinguish between approaches that aim to maintain a status quo, and those that see adaptation as an opportunity for deeper, more meaningful change. Resilience aims for actions that improve the performance of a system under risk, without questioning the underlying assumptions and structures. Transition describes adaptations to provide groups with access to existing, but unclaimed rights. Transformation describes addressing the less visible causes of vulnerability, questioning priorities, boundaries and assumptions. Indeed, if

we acknowledge the role that embedded social structures play in vulnerability, this later approach is essential. As Pelling (2011: 23) argues, these social and political factor that constitute the root of vulnerability, are often considered beyond the scope of adaptation, or not considered. The risk of a resilience-only approach is that in not questioning overarching structures, and maintaining these structures, reductions in immediate risk mean that the larger system may still move towards collapse (Pelling, 2011: 24).

There are a number of key theories from development and climate literature that present useful frameworks for how to approach adaptation from a transformation perspective, including socially just adaptation theory, adaptation as transformation, and gender justice. These frameworks offer insights into how adaptation could be operationalized as a tool for social change, guiding, as well as guided by, existing social norms, identities and structures.

Socially just and sustainable adaptation approaches consider the links between environmental changes, and distributional and procedural justice. Eriksen et al. (2011) present a framework for sustainable adaptation, which requires a commitment to "social justice and environmental integrity". Firstly, adaptation efforts need to recognise that multiple ecological, economic, political, and social factors create vulnerability (Eriksen et al. 2011). Secondly, affected groups need to be involved and represented throughout process, reflecting a commitment to procedural justice and recognition (Eriksen et al. 2011; Thomas & Twyman, 2005). Putting the voices and needs to women at the heart of decision making would be a key requirement. Beck (2015) talks about the need to include those affected by climate change to encourage shifts in social and political norms and new power structures between those who have caused climate change, and those affected by it. Thirdly, local knowledge needs to be incorporated into adaptation choices, to incorporate the knowledge and priorities of affected people. Community-Based Adaptation (CBA) initiatives, for example, aim to develop initiatives built on the knowledge and decisions of affected communities, with participatory methods helping to develop local initiatives and empowerment (Huq & Reid, 2007; Rashid & Khan, 2013). Finally, recognition of the ways in which initiatives will affect the environment both positively and negatively in needed, placing initiatives in a global and local context, suggesting that there are physical, as well as social, limits to the efficacy of adaptation efforts (Warner et al., 2012).

Gender justice approaches aim to "put gender roles and equality issues at the heart of measures and mechanisms to deal with climate change" (Lahiri-Dutt, 2012: 108). Gender justice describes a broader project to ensure equality in terms of capabilities, livelihoods and agency, to ensure not only equal opportunities for genders, but equality of outcomes (Seguino, 2008). Seguino (2008) engages here with Sen's (1999) concept of development as freedom and agency to lead lives of dignity. As such, gender justice needs to focus on achieving women's political, economic and social capabilities, which in turn build women's agency (Roy & Venema, 2009). If gender inequality and injustice contributes to climate change vulnerabilities, as argued above, then gender justice needs to be at the heart of adaptation. Hemmanti and Röhr (2009) argue that gender justice is a more useful than terms such as 'gender equality' which refer to equality within existing power systems, which have caused climate change. Rather, gender justice is understood as "an obligation for change, not just rights" (Tschakert & Machado, 2012: 287). As such, gender justice needs to go beyond drawing women into existing systems, to work towards transformations of current systems and structures which have created social and ecological vulnerabilities (Hemmanti and Röhr, 2009; Lahiri-Dutt, 2012).

Allen and Sachs (2007), drawing on the work of Moser (1989) and Molyneux (1985), provide a framework that can be useful for conceptualizing gender justice. These authors describe a spectrum of responses to unequal gender relations, including 'practical, and 'strategic' gender needs and interests. *Practical needs* describe strategies to ensure survival within existing gendered and power structures, including struggles to access essential resources such as water and food. Practical needs emerge out of gendered divisions of labour that render women responsible for water and food, health care and caring for children and other family members (Molyneux, 1985; Moser, 1989). While these practical needs emerge out of power structures at the intersection of class and gender, struggles for practical needs often do not address these underlying structures (Molyneux, 1985). The concept of *strategic needs*, in contrast, describes the need to dismantle the structures that lead to women's subordination. Drawn from gender power analyses, such initiatives seek to build alternatives to existing structural arrangements – such as removing barriers to women's ownership of land and access to financial resources, alleviating burdens of childcare and household work, bodily and reproductive freedoms and agency, and safety from gender-based violence (Molyneux, 1985). These needs emerge from social positions and gendered roles and relations (Molyneux, 1985), as well as class and ethnicity (Allen & Sachs, 2007). A similar approach has been

developed by CARE International (2010), in the distinction between 'gender-sensitive' and 'gender-transformative' approaches to development and adaptation. Gender-sensitive approaches acknowledge, and seek to work with, gendered roles, resources and power. Gender-transformative approaches, conversely, challenge these social norms and structures, and encourage "critical awareness" among women and men (CARE International, 2010: 3). CARE International's (2010) approach to gender transformation centres on a conceptualisation of women's empowerment that not only considers women's own agency, but also structural environments, political and economic contexts, and micro-level structures including mobility and household relationships and decision-making. Sen (1999) similarly makes the distinction between women's wellbeing, and women's agency, arguing that there is a need to focus on efforts that there is a need to focus on women's free agency, capabilities and entitlements, which will lead to improvements in wellbeing. This links with Tschakert and Machado's (2012) work on "adaptive social protection", which draws together human security and gender justice as the basis of transformative adaptation (Tschakert & Machado, 2012: 287).

Adaptation and development literature offers some ideas as to how these theoretical ideas could be operationalised to pursue strategic and transformative gender approaches. For Tschakert and Machado (2012), a transformative approach to adaptation is operationalized through a combination of social protection, community-based adaptation, and disaster management, with communities empowered to achieve their rights. Lahiri-Dutt (2012) describes a grassroots mobilisation initiative in India, with efforts towards the empowerment of women farmers as political actors, alongside multifunctional agriculture that aims for environmental protection, as well as nutrition, productivity and production. Hafiza and Neelormi (2015) flag mobility as a key aspect in women's economic empowerment, and key to community resilience. Mobility can have a range of positive flow-on effects into other spheres of women's lives (Kabeer et al., 2011).

Collective action emerges as a powerful tool in the pursuit of gender justice. Collective action can encourage more equitable distribution of resources, and can help groups to share risk, and engage in long-term planning (Pandofelli, Meinzen-Dick, & Dohrm, 2008). Htun and Weldon (2012) identify autonomous feminist movements as the key force in the development of progressive policies regarding gender based violence. Kabeer's (2011) work in Bangladesh documents how women's groups evolved from what can be described as practical needs

(savings groups) towards strategic needs, with actions to improve women's political representation, gender-based violence, early marriage and dowry, and land rights, through "reflective forms of practice generally absent in lives that were dominated by the struggle for survival" (Kabeer, 2011: 511). Hafiza and Neelormi (2015) similarly argue that community organisations provide space for understanding common issues, and raising a collective voice, and can effectively work to bolster both practical needs, such as economic empowerment, and strategic needs. In addition, it is not enough to simply have women involved. For procedural justice, measures are needed to ensure women's voices are heard and incorporated, engaging both men and women. The importance of family in this context needs to be acknowledged – Makita (2009: 389) discusses the ways in which women's work can be valued and "visible" within households, which she argues is often reliant on husbands' cooperation and collaboration.

Agency also emerges as a key tool in the realisation of gender justice. Sen (1999) outlines agency as a key goal in development – the practice of freedom – as well as a tool for people to achieve wellbeing and social, economic and political freedom. Agency becomes both a tool, and an outcome. In the context of adaptation, agency is part of adaptive capacity - having agency means that people are able to pursue adaptation, as active "agents of change" (Roy & Venema, 2009: 19). Indeed, in the context of environmental change, people are never simply passive victims, but active agents, but this agency exists within social, political, economic and cultural constraints (Coulthard, 2012). Within development studies, agency has tended to be conceptualised as resistance to oppression, enacted by rational, self-interested subjects, working towards "goals of progressive politics" (Mahmood, 2005: 34). Rashid (2013) Mahmood (2005) and Wilson (2013) have sought to conceptualise agency in a way that does not pre-presume western, liberal conceptions of autonomy, resistance and emancipation. Mahmood argues that agency be understood not as a synonym for resistance, "but as a capacity for action that historically specific relations of subordination enable and create" (Mahmood, 2005: 18). Rashid (2013) applied this conception in her research with women in Bangladesh whose husbands have migrated internationally. Her research found complexity in the outcomes experienced by women, highly dependent on relationships with extended family members, with women aspiring to uphold cultural values and norms, rather than freedom and autonomy. As such, women's power and agency can be seen as enacted within these identity-forming contexts. Coulthard's (2012) work examining agency in relation to resilience within fisheries communities, highlights the ways in which women

ensure the resilience of their communities - by trading-off their own wellbeing for the sake of their families. Coulthard (2012) stresses the ways in which agency functions within existing social structures, and the decisions people make between everyday and long-term goals, and individual and collective goals. Kabeer (2011), in her work on women's movements in rural Bangladesh, describes processes of 'path dependency' in the ways in which women's movements work, and the kinds of issues they focus on. The importance of marriage and family remained central in many of these movements, and women navigated negotiations with their husbands to engage in these organisations, and highlighting mutual responsibilities between women and men, and greater rights and freedoms within families, rather than independence – "family and kinship remained a key source of security" (Kabeer, 2011: 525). Just as Mahmood (2005) has sought to shift notions of agency away from western conceptions of autonomy, Kabeer (2011) suggests that affiliation, rather than autonomy, may be a central value driving women and women's movements in Bangladesh, arguing that the value given to affiliation is a product of particular contexts, just as the value of autonomy is in other contexts. Similarly, Kandiyoti (1988: 285) and others have explored the concept of the 'patriarchal bargain', representing women as 'rational actors' who "resist, accommodate, adapt, and conflict" within the boundaries of a patriarchal system, through "passive resistance" in "paradoxical forms". However, in revisiting her own work, Kandiyoti (1998), argues that there is a need to remain critical of arguments that use this bargain to conceal ongoing evidence of oppression, relabeled as 'choice', which have served to make empowerment and agency amenable within neoliberalism (Wilson, 2015). Such insights reinforce the need for broader structural environments that ensure full capabilities and the importance of procedural justice, in order to ensure gender and social justice. In a more practical sense, transformative adaptation should incorporate agency by way of a commitment to procedural justice, ensuring that women's voices, preferences and identities are at the centre of adaptation research and practice.

Drawing on this literature, and in concert with adaptive capacity vulnerability theory, I envisage that transformative adaptation approaches need address exposure, sensitivity and limitations in adaptive capacity, by incorporating:

- Initiatives to meet people's practical needs by targeting economic capabilities and livelihoods,

- Initiatives that meet people's strategic needs through collective action and procedural justice.

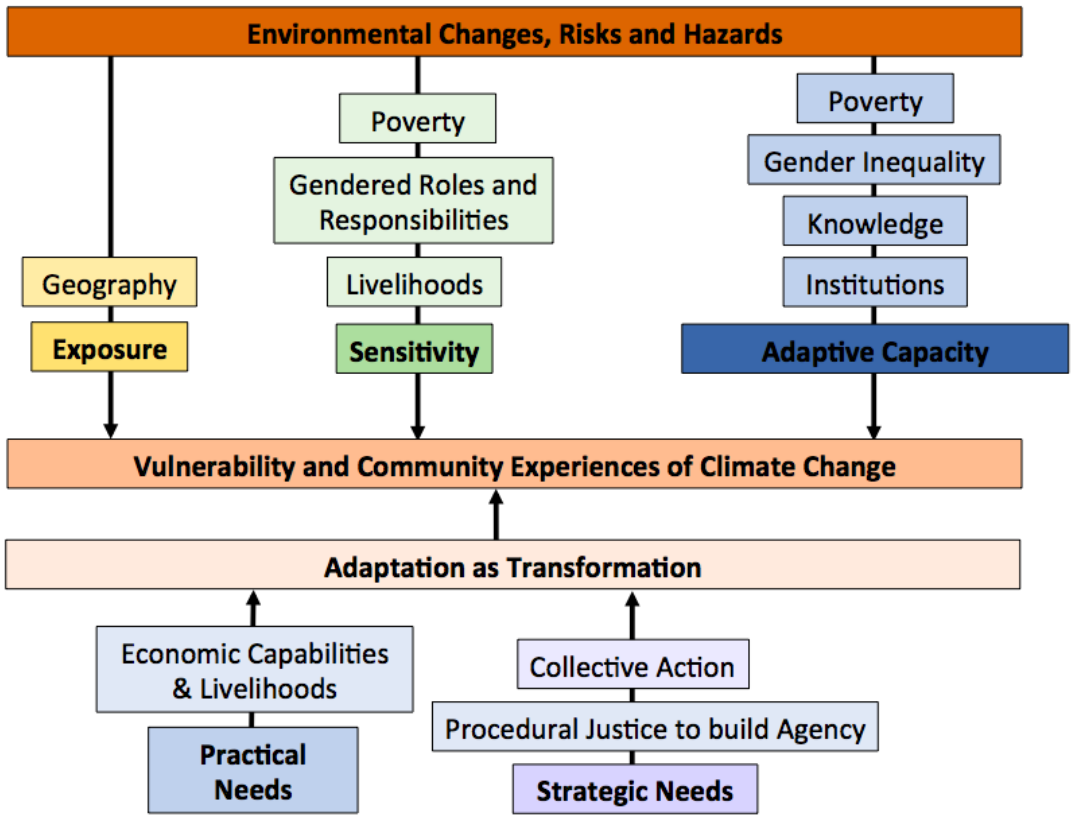
Summary and Conclusion

This chapter has examined the existing theoretical and empirical literature regarding climate change, gender and adaptation, and highlights a number of gaps for investigation. Adaptive capacity vulnerability theory is presented as an overarching framework, which conceptualises vulnerability as a combination of exposure to environmental hazards; sensitivity in the ways in which social relations expose particular groups to hazards and risks; and, the capacity of a community to call on resources and entitlements in order to adapt. Conceptualisations of vulnerability as a social, as well as an ecological, issue shed light on the ways in which pre-existing power configurations contribute to vulnerability. However, the environment itself, and the underlying causes of environmental change, has been missing from much adaptive capacity literature, suggesting the need to draw in insights from 'ecosociology' methodology, by situating the environment as part of the social (see Stevens, 2012). The methodological approaches to this are outlined in Chapter Three.

Gender emerges from the literature as a key site of climate inequality. Conceptualising gender as a negotiation between people, spaces and ecologies (Sultana, 2009: 440) allows for examinations of the ways in which gender is constituted through environmental practices, leading to vulnerabilities in the face of environmental changes, but also opportunities for re-negotiations. Much literature has documented the greater risks to women in terms of mortality due to natural disasters, and greater workloads in degraded environments. What this literature suggests is that gender inequalities are a key factor in climate change vulnerability, and as such, need to be addressed in adaptation responses. Such analysis, however, needs to be driven by feminist analysis that recognises gender relations as dynamic and changeable, a key criticism of the gender and climate literature to date. Chapters Five and Six draw on these ideas to examine the exposure, sensitivity and adaptive capacity among the case study communities, in order to understand the underlying structural processes contributing to vulnerability to climate change.

In seeing vulnerability as a social process, adaptation needs to incorporate both environmental responses, and social transformations, in order to address the underlying issues leading to sensitivity and reduced adaptive capacity. As such, adaptation initiatives should address gender inequality as a key site and cause of vulnerability. In order to create a space for understanding adaptation that acknowledges gender roles and broader societal structures as contributing to vulnerability, the concept of 'adaptation as transformation' is of use. This provides a framework for analysing adaptation responses that interrogates underlying structures leading to exposure, sensitivity and constrained adaptive capacity. Within feminist and development literature, collective action, visibility and agency are situated as key tools in the pursuit of gender justice. However, there has been limited scholarship examining adaptation in terms of its capacity to address the social and political aspects underpinning vulnerability. As an early body of literature highlights, some adaptation initiatives are at times serving to re-create gendered divisions and power relations. Figure 2.3 outlines the conceptual framework for the thesis, providing an overview of the key vulnerability factors, and the key concepts within transformative adaptation, which aim to address vulnerability in systemic and strategic ways.

Figure 2.3: Conceptual Framework



Source: Author

Chapter Seven applies these ideas to examine adaptation processes observed in the case study communities, and to assess the ways in which these initiatives might be contributing to evolutions in gender relations.

The following Chapter Three: The Research Process, discusses the ways in which the lines of enquiry outlined here were investigated in the field. A critical realist methodology and participatory and feminist approach to research draw together key ideas here, to drive an investigation into the structural factors leading to vulnerability, and the capacity for adaptation to addresses complex social inequalities.

Chapter Three: The Research Process

Introduction

Vulnerability to environmental change is social, as well as biophysical, with gender as a key factor influencing experiences of environmental change. To explore these issues – environmental changes, the implications of gendered power relations, alongside the capacity of communities and institutions to respond to environmental changes – a methodology that appreciates both social and environmental factors is required. In this chapter, I outline the development of a feminist political ecology-led research approach. The chapter firstly outlines the ontological and epistemological framework underpinning the research, being critical realism. This is informed by feminist and political ecology methodologies that emphasize the importance of participatory tools and multiple methods for examining social norms and changes in the context of environmental dynamics. I then detail the processes by which qualitative data were generated across four integrated case study communities in Bagerhat, Khulna City and Dhaka City, through the use of interviews, focus groups, observations, and participatory tools. This methodology responds to ethical considerations associated with cross-cultural research that focuses on women, livelihoods and natural disasters, and reflexivity in the research process. Finally, I discuss the thematic and retroductive approach to data analysis that was used.

Establishing Methodology: Feminist Political Ecology and Critical Realism

The research questions and theories outlined in Chapter Two require an examination of the ways in which communities understand and experience environmental changes, the social and political mechanisms underpinning these changes, and the social factors influencing the capacity for communities to adapt. The research focuses on gender and the ways in which social inequalities craft, and are crafted by, interactions with the natural environment; this requires a methodological approach that acknowledges the causal interactions between communities and the natural environment. The following section considers the methodological underpinnings of political ecology and feminist political ecology (FPE) research paradigms, which justify the selection of a critical realist methodology.

Political Ecology Methodology

Political ecology has provided a rich base of research and theory, from constructionist and post-structural perspectives, by focusing on ideologies, discourses and understandings to deconstruct environmental 'truths' and the ways in which "ideas and narratives about nature and society are mobilised" (Robbins, 2004: 116). However, such approaches have been criticised for overlooking direct engagement with environmental realities (Biersack, 2006). The material causes and outcomes of climate change, for example, problematises the use of strong constructivist approaches, but also draws attention to the ways in which social and political forces are interlinked with the natural world. Ontologically, climate change has real, material, manifestations, while also being shaped by social norms, politics and discourses (MacGregor, 2010: 229). Climate change is also a global environmental phenomena that transcends socially constructed boundaries and conceptions, while also being experienced in varied and unequal ways (Zehr, 2015).

Recently, political ecologists and human geographers have been engaged in a "rematerialisation" of bodies, resources and biophysical processes, that move beyond the social construction of nature (Bakker & Bridge, 2006). As Dunlap and Catton (1994: 7) argue, "limiting sociological attention to the ways in which global environmental problems have been recognised, defined and legitimated inhibits our contributions to understanding the causes, consequences and possible amelioration of such problems." Biersack (2006: 27) adds that "… the argument that there is no nature, only ''nature,'' a construction, has little appeal for most political ecologists, for whom the stakes must be real and material if they are to be fully political." As such, methodological approaches that occupy a middle ground between post-structuralism and more grounded approaches are required (Biersack, 2006). This is where a 'realist political' ecology proves useful, acknowledging the "social and institutional factors that both frame and experience externally real biophysical processes" (Forsyth, 2001: 151). This opens opportunities for exploring and critiquing both social perspectives on environmental processes, as well as the construction of knowledge on the environment (Forsyth, 2001), within a context where an objective environmental reality exists.

Critical Realism

A critical realist approach provides an ontological and epistemological framework to draw together a view of an objective reality, and includes a strong focus on social structures such as gender, inequality, agency and agricultural practices.

Ontologically, critical realism argues that an objective 'real world' exists (Easton, 2010), which cannot be reduced to experiences of subjects (Clegg, 2006). Rather, reality consists of linked scales, or stratified realities, including 'deep', 'actual', and 'empirical' levels of reality. The real or 'deep' world consists of underlying structures and generative mechanisms that can exercise power and interact under certain conditions. Collier (1994) offers the example of striking a match – this generative mechanism exists in the deep world, regardless of whether it is triggered. The actual, then, is where these events occur – a mechanism is triggered, a match is lit, with outcomes that may or may not be perceived or understood by people. The empirical level or reality is then where events are observed, experienced and measured. Outcomes of these causal mechanisms, however, are not pre-determined, but rather, exist within specific geographical and contextual triggers (Parr, 2015). The task for social scientists is to consider the generative mechanisms that produce social phenomena, outcomes and experiences in the everyday world (Clegg, 2006; Easton, 2010), going beyond given data to consider interpretations of meanings (Danermark et al., 2005).

Importantly, critical realism offers a way for sociology to draw the natural world into analysis and consideration, without reduction to discourses, interpretations and experiences. Social phenomena are the result of "interaction between social structures, mechanism and human agency" in an open system (McEvoy & Richards, 2006: 70), which includes openness between the social and the natural (Carolan, 2005a). Within this model of linked, stratified realities (Carolan, 2005a; New, 2005), social phenomena are not real in the material sense, but real in that they possess causal powers (Parr, 2015), and are situated alongside material realities, a "complex web of biological, chemical and physical interactions" (Carolan, 2005a: 1). As Carolan (2005b: 401) writes, "as biophysical phenomena are concomitantly social, so too are social phenomena concomitantly biophysical".

As such, critical realism provides a useful ontological and epistemological base on which political ecology, and feminist political ecology, can be articulated. For example, the links between food and gender, as examined in Chapter Six, demonstrate how women's

engagement with biophysical food and agricutlural environments is mediated by expectations around gendered roles, in specific class and geographic contexts. Critical realism allows for the examination of socially constructed meanings and practices in relation to the autonomous dynamics of nature, allowing for a deeper and more complete analysis (Murphey, 2002), while helping to overcome issues regarding constructivist approaches typically found in political ecology work.

Epistemologically, critical realism sees the production of knowledge about the world as itself a social practice. Theories and knowledge claims produced from social research are imperfect and based on theory (Easton, 2010), and are not a direct representation of reality (Carolan, 2005a). Rather, knowledge is historically and culturally situated, and assessable and re-assessable over time based on the application of novel theories (Parr, 2015). Social research is itself a social activity (Olsen, 2004: 147). Such an approach encourages the use of a diversity of methods to explore phenomena in depth (McEvoy & Richards, 2006), with a view to tapping into both observable reality, as well as interpretation, discourses, relationships and patterns of practice, to overcome methodological limitations of both positivism and interpretivism (McEvoy & Richards, 2006). Critical realism, as such, lends itself to more 'intensive' approaches to qualitative research, that investigate a small number of cases in detail, in order to generate causal explanations for social phenomena that illuminate mechanisms and structures (Danermark et al., 2007). In incorporating these insights, this thesis includes interviews, focus groups and participatory methods to generate rich, contextual data regarding the four case study communities. The data generated through these processes include textual data and photographs, analysed through a thematic and retroductive approach (discussed further below).

Feminist Political Ecology and Feminist Methodologies

Critical realism situates gender and other key social categories as a potential structure that constitutes knowable reality, with "real material and social effects", particularly in terms of life outcomes, access to resources, self-perceptions and treatment by others (Martinez Dy, Martin, & Marlow, 2014: 458). Such an approach encourages a focus on the social meaning and structural positions conveyed by these categories (Martinez Dy et al., 2014), examining the role that gender, as well as geography, livelihood and socio-economic status, play in

experiences of environmental change and adaptation. I have sought to interrogate the role that gender plays in agricultural and adaptation initiatives – what power this structure wields in people's lives, alongside other generative mechanisms that influence the lived experience of gender – taking a more intersectional approach (Martinez Dy et al., 2014). I have also interrogated those structures that can encourage or hinder changes in gendered divisions, including agency, governance, poverty, knowledge and empowerment, while acknowledging that gender and other social categories are durable, yet fluid (Martinez Dy et al., 2014).

Feminist political ecology provides a further basis for such analysis, placing gender as a key consideration in methodology and analysis and drawing attention to the role of gender in environmental processes (Elmhirst, 2011). As outlined in Chapter Two, subjectivities, such as gender, are seen as negotiated, in part, via interactions with the material environment, and performed through everyday tasks such as agricultural and food work (Nightingale, 2011; Sultana, 2011). Gender is seen as a "critical variable in shaping resource access and control" (Rocheleau, Thomas-Slayter, & Wangari, 1996: 4), with struggles over resources often reflective of gendered power relations at multiple scales. Gender, as well as class, religion and culture, can also mediate differences in knowledge, rights and control (Sultana, 2006). Given the links between gender and climate change outlined in Chapter Two, MacGregor (2009: 124) writes, "… any attempt to tackle climate change that excludes a gender analysis will be insufficient, unjust and therefore unsustainable".

Feminist political ecology directs attention to not only the gendered nature of human-environment relationships, but also towards theory focused on equality and change. As Chafetz (2006) writes, there are three key features that underpin feminist theory:

1. A focus on inequities inherent in gender arrangements;
2. An assumption that gender relations are social creations, and are subject to change;
3. A normative commitment to gender equity.

These theoretical underpinnings have informed the research methodology and design of this thesis in a number of ways. Firstly, an ontology and epistemology is needed that considers environmental, material and social factors among the objects of concern, which critical realism provides. Secondly, women's voices, and women's roles in agriculture and adaptation are elevated in research processes. Thirdly, these perspectives have guided theory regarding

transformative approaches to adaptation. Overall, I seek to provide critiques and recommendations regarding the ways in which gender is considered in adaptation.

Reflexivity

Being reflexive as to the positionality of myself and my research assistant was an important part of the research process, acknowledging that the production of ideas are influenced by their social setting, and the relationships between people involved (Hughes & Sharrock, 2007). In particular, I considered comments from MacGregor (2010: 226-7), who argues that feminist researchers from the "'over-developed,' affluent world" can inadvertently silence and misrepresent people. My "social and political locations" have an impact on the research process, and consideration is needed with regards to the production of knowledge, and the research process, with attention towards research purpose, ethics and interpersonal interactions (Guillemin & Gillam, 2004: 274). While I had spent twelve months previously living and working in Bangladesh prior to fieldwork, an important part of orientation and cultural understanding (Irvine, Roberts, & Bradbury-Jones, 2008), I remained conscious of myself as an outsider, without in-depth language skills and lacking local cultural knowledge.

These reflexive considerations influenced the design of this project, as well as practical decisions I made in the field. To overcome some of these challenges, it was important to be accompanied by a local "cultural broker" (Liamputtong, 2008: 67) who would be able to connect with participants and give me advice regarding navigating a new cultural landscape in an appropriate way. I sought advice from a local NGO to help me identify and hire a research assistant, but staff suggested that hiring a women would not be appropriate for safety reasons and for securing interviews with people in positions of power. However, hiring a women was important in order to have discussions with women in the field. After interviewing two students from the local university, I hired Naoshin Jahan, a young woman environmental scientist, who not only assisted with translation, but provided essential cultural and social advice. Importantly, Naoshin's family's home village was close to the case study villages. This became an important part of building relationships with participants, as many interviews began with Naoshin outlining her family history, the location of her home village, and the farming work that her family do. At times, she also connected with student peers who came from villages next to, or close to, our case study villages, who were able to introduce us

to new participants and local leaders. While it may have been preferable to hire participants from the villages themselves, Naoshin's background, education, gender and local knowledge allowed us to navigate the field sites with her as an active participant in these settings.

In terms of research practice and ethics, 'gender sensitive' approaches have been discussed extensively in cross-cultural, development and feminist literature. This involves understanding and acknowledging the limitations that may be on women – time, geography, mobility, responsibilities and social expectations – in order to aligning with efforts on community-based research for "identifying and reducing barriers to people's participation" (Delva et al., 2010: 116). We conducted interviews early in the morning when women were free of other duties, and also made women aware that they could leave or end the interviews at any time if they needed to. We also endeavored to conduct interviews and focus groups without men present, in order to overcome potential cultural power dynamics that would inhibit participation (Laimputtong, 2010). The open nature of the villages, and the communal nature of courtyards, made this a difficult challenge to overcome. During nearly all interviews a group of children, men and other women would gather to observe. On one instance, an onlooker in an interview in Fakirhat commented at the end of the interview that we were there to "*take our wives away*". To overcome these challenges, we checked with participants to see if they were comfortable speaking with us, and we sometimes asked onlookers to leave, which was respected. In Baintola, for example, our interview with Reshma [Baintola, 7] was conducted in two separate sittings, after a large group had made her feel uncomfortable about speaking.

There is much less literature regarding the gendered impacts of research with regards to men. Men were often much more difficult to gather in groups, as they were often busy out of the village in faraway *ghers* (shrimp ponds) and fields. In Fakirhat, for example, after ongoing consultation with men and their wives, two focus groups were postponed due to low-turnout. To engage with men, my research assistant often sought out the help of male university students, familiar with or from the local areas we were working in, to help facilitate access and discussion.

Timeline of Fieldwork

Fieldwork involved an initial four month period of work between October 2014 and February 2015. This period included site selection, interviews and focus groups in each of the case study villages, and interviews with institutional representatives in Dhaka and in Khulna city. In keeping with the participatory and engaged approach to fieldwork, this was followed by a month-long visit in January 2016. This visit involved focus groups in each of the case study villages, as well as some follow-up interviews, and interviews with other institutional representatives. The second trip allowed us to share key findings with participants to gather feedback and confirmation in a process of "member-checking" (Colucci, 2008: 247). In addition, we were able to ask further questions to clarify key issues and deepen understandings. This return visit also allowed us to observe important changes that had taken place in the villages, indicative of generative mechanisms at work over time. In Hurka, we observed the completion of an access road that people had discussed in the first period of fieldwork, highlighting political marginalisation and the impact of industrial economic development. In Fakirhat, we witnessed evidence of gendered exploitation that had occurred when one NGO project had finished, and a new NGO had arrived. In Chitolmari, we observed the continuation of an adaptation initiative after the instigating NGO had left, indicative of improved adaptive capacity. This follow-up visit also helped to build enduring connections between myself, my research assistant, and the case study communities.

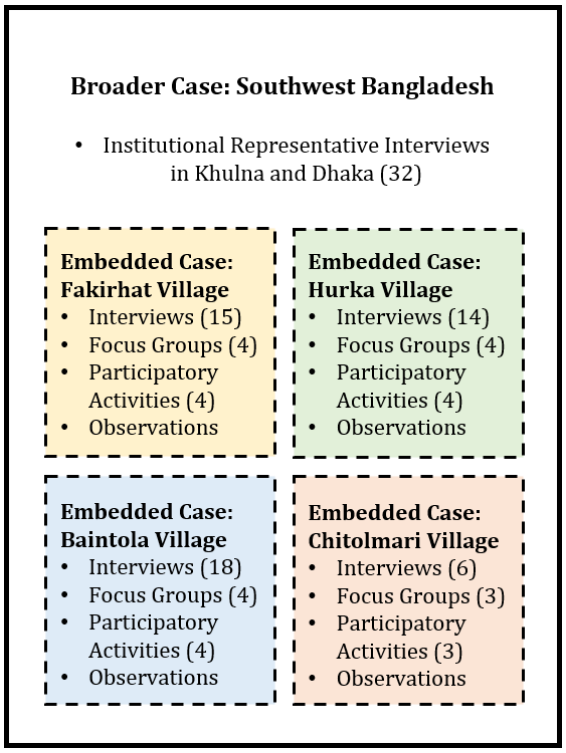
Embedded Case Study Approach

Aligning with feminist-political ecology and critical realism, this research involved a series of qualitative, village-based, case studies aimed at examining social and environmental mechanisms specific to the context of the Southwest (Danermark et al., 2004; Easton, 2010). Case studies are particularly suited to a critical realist approach, encouraging an 'intensive' approach to research that seeks to understand phenomena in context (Wynn & Williams, 2012). Local level research is also well placed to investigate questions regarding adaptation, which, although influenced by national and global forces, takes place locally (Wilbanks & Kates, 1999).

Analytically, multiple village case studies enable a cross-case synthesis, drawn together as "embedded units of analysis" within a wider case of Southwest Bangladesh (Yin, 2014: 167).

As outlined in Figure 3.1, the village-level case studies were conducted using a mix of qualitative methods. Alongside these, interviews with institutional representatives generated data on this wider unit of analysis, with insights into policy, broader environmental changes, international relations and national-level understandings of gender and poverty. These insights help to synthesise findings from across the case study villages, and to develop cross-case theories regarding the role of gender in agriculture and adaptation.

Figure 3.1: Embedded Case Study Design



Source: Author

Following Harvey's (2009) case selection criteria, a series of four village-level cases were included. Villages offer what Harvey describes as "meaningful analytic closure" (2009: 24) at the local level and exist as integrated social system within themselves. Villages are constituted of groups of households, often home to a number of extended families (Rashid, 2013), allowing for analysis of diverse household responses to shared environmental challenges. In addition, a case study developed from a feminist perspective allows for documentation of women's lives and achievements in particular contexts, providing both description and analysis of women's lives that other approaches tend to overlook (Reinharz, 1992).

Critical realist research encourages the use of multiple methods, with a view to tapping into observable reality, as well as interpretations, discourses and relationships (McEvoy & Richards, 2006). Feminist research encourages the use of multiple methods that acknowledge the contextual and complex nature of phenomena and individuals (Reinharz, 1992). As such, a mix of interviews, focus groups, and participatory methods at the individual, household and village levels was selected. This choice of methods is drawn from feminist political ecology research (Bee, 2013; Hovorka, 2006; Nightingale, 2003; Rocheleau, 1995; Sultana, 2007a), community-based adaptation research (Reid et al., 2009) and food security research (Coates et al., 2010).

Site and Case Selection

As indicated above, the broader "unit of analysis" (Yin, 2014: 167) in the case study design is Southwest Bangladesh. Southwest Bangladesh was selected based on a number of key factors. Firstly, there is extensive literature, as well as media coverage, which highlights the Southwest as being particularly vulnerable to climate change. The area was affected by a number of cyclones in the past decade, as well as flooding and extensive land and water salinity (see Chapters Four and Five for further discussion). Secondly, pervasive gendered inequalities have been documented in the region, allowing for an examination of the interactions between gendered norms, climate change and adaptation. Thirdly, a number of NGOs have been working in the Southwest, with explicit climate change programs. Finally, my previous experience in Bangladesh, and networks and connections in the Bagerhat district, gave me a body of background knowledge that was essential to the project design and ethical approach.

Four case study villages within the Bagerhat district were selected as embedded units of analysis within this broader context of Southwest Bangladesh, representing a variety of environmental challenges and adaptation responses. Bagerhat stretches from the coast nearly 140 kilometres inland. Aquaculture and rice are the major agricultural products, followed by a number of cash crops. Almost 36 per cent of people in Bagerhat are engaged in agriculture (Adaptation and Mitigation Knowledge Network, 2015), and the majority of participants who took part in this study were engaging in a combination of agriculture and aquaculture (fish, shrimp and crabs) for subsistence and market sales. Aquaculture included *bagda* (saltwater

shrimp), and *golda* (freshwater shrimp), with farmers often growing both in the same pond. The majority of shrimp and crab produced was exported. Indeed, shrimp has been an important part of the political economy and ecology in the region – Fakirhat and Rampal Upazilas have been referred to colloquially as the 'Kuwait of Bangladesh', due to the contribution of shrimp in earning foreign income.

Village Case Study Selection

Four villages were selected in the inner-coastal region of Bagerhat (see Figure 3.2). The key criteria for selection included:

- Rural location in the inner-coastal region of Bagerhat. This provided a boundary in terms of governance processes and well as ecological characteristics.
- Had experienced some level of environmental change over the past 20 years. Table 3.1 documents the key characteristics of each village. Each village had been affected by cyclones in the last 10 years, and all have a history of salinity and shrimp farming. The four villages included in the study offer a cross-section of the range of environments found in Bagerhat, including areas within embankments (Chitolmari) outside of embankments (Baintola, Fakirhat and Hurka) and areas facing high salinity, (Hurka), and saline free areas (Chitolmari). Baintola and Fakirhat had both experienced a decline in salinity in the last five years, associated with nearby rivers and adjoining canals becoming silted to the point of death, stopping tidal flows from reaching the village. Across the four field sites, communities were facing a range of environmental challenges and changes. Most significant were the impacts of cyclone Sidr in 2007, cyclone Aila in 2009, salinity, waterlogging and drinking-water issues, and problems with aquaculture disease.
- Agriculture as the primary livelihood, which including production of rice, shrimp, vegetables, crab and some cash crops.
- Evidence of current adaptation initiatives taking place. Each village had evidence significant changes in farming practices that had happened as a result of spontaneous reaction to environmental changes, or NGO projects. However,

as will be discussed in Chapter Seven, not all of these activities can be fully understood as adaptation – some may be better described as 'coping' while others can be seen as maladaptation.

- Support from the community for the research to proceed.

Access to the field was initiated with the assistance of local NGOs, and in the case of Fakirhat, via my research assistant's local knowledge and connections. In Baintola and Hurka, we were introduced to key participants, and helped with setting up early focus groups, with the assistance of a local NGO working in these villages. Similarly for Chitolmari, we were advised to visit there after a meeting with another local NGO, who introduced us to a farmers' group in the village. In Fakirhat, we had received advice at the nearby urban centre that the area had experienced some declines in salinity, and as such, was a unique case. Drawing on Naoshin's local knowledge, we introduced ourselves to a woman in the village who worked from a women's group and helped to facilitate the first focus group.

Figure 3.2: Map of Field Sites

Source: Google Earth

Table 3.1: Characteristics of Case Study Villages

Characteristics	**Baintola**	**Chitolmari**	**Fakirhat**	**Hurka**
Main Religion	Hindu & Muslim	Muslim	Hindu	Hindu & Muslim
Drinking water	Some salinity	Iron & arsenic	Some salinity	Some salinity
Embankment	No embankment	Within an embankment	No embankment	No embankment
Salinity	Declining salinity	No salinity	Declining salinity	High salinity
NGO and Government Projects	Climate resilience project Handicrafts	Sunflowers	Virus-tolerant aquaculture	Virus-tolerant aquaculture Women's savings group
Agricultural products	Rice Vegetables Broiler Chickens Salt & freshwater shrimp, fish	Rice Fresh water shrimp Vegetables Cash crops: jute, wheat, lentils, sunflowers	Rice Some vegetables Salt & freshwater shrimp, fish	Crab

Source: Author

Baintola, Rampal

Baintola (within the Rampal Upazila) was located 35 kilometres southwest from Khulna, and the people here identify as Hindu and Muslim. Main livelihood activities for families included rice farming, aquaculture, chicken farming, and off-farm employment (see Image 3.1). Key issues the people here were facing included a lack of viable livelihoods, residual salinity in the drinking water, untimely rain, limited agricultural outputs and waterlogging. The village was affected by cyclones Aila and Sidr, with people reporting that both caused flooding, uprooted trees, and destroyed structures. People took shelter in their homes. As will be discussed in more detail in Chapter Five, the area had seen a decline in salinity in the past five years, and a revival in terms of wellbeing and livelihoods.

We were introduced to people in Baintola via an NGO running a climate-resilience project in the village, which had involved training for new crops, composting, livelihoods, handicrafts and a savings project. Another NGO was running a microcredit scheme for women. Eighteen interviews were conducted in Baintola, involving 18 women, three men, a local woman doctor, and two interviews with one of the NGO field staff who had a long personal association with the village. Interviews with members of the local government were also carried out. Four focus groups were organised, with 18 people – two with groups of women, one with a group of men, and a follow-up focus group the following year.

Image 3.1: Aquaculture Gher in Baintola

Source: Author

Fakirhat, Fakirhat

Fakirhat village (in the Fakirhat Upazila) was located 40 kilometres east from Khulna, and between the Chitra River and the Bhairab River. People in the village are predominantly Hindu. The majority of families were practicing combined aquaculture and rice farming (see Image 3.2). The area has been involved with shrimp farming for nearly 30 years, and shrimp had previously been the main source of income in the area. Similar to Baintola, the Fakirhat village had seen a decline in salinity over the past 10 years. The village was affected by both Aila and Sidr, with impacts including flooding, animal and tree deaths, and destruction of property. Key issues here included poverty and unemployment, linked to low prices of aquaculture products, aquaculture virus, and difficulties in accessing suitable water for drinking and irrigation. A number of NGOs were working in the area, including microcredit organisations, women's savings groups, and an agricultural NGO. While Fakirhat Union was home to a cyclone shelter, and a number of schools that can also be used as shelters, people in the village reported that a more accessible shelter was needed.

Fifteen interviews were conducted in Fakirhat, including 13 women and 3 men, and additional interviews with members of the local government and some NGOs working in and around the village. Four focus groups were also held, which included men's and women's focus groups at the start of field work, a women's focus group at the end of field work, and a follow-up women's focus group the following year.

Image 3.2: Integrated Gher and Rice Farming in Fakirhat

Source: Author

Hurka, Rampal

Hurka village, in the Rampal Upazlia, was located 40 kms from Khulna, close to the Rupsha River. The village was a mix of Muslim and Hindu families. The majority of families were involved with crab farming (see Image 3.3) and the area had been involved with aquaculture for the past 30 years. In the past five years, significant issues with virus among shrimp have resulted in most farmers shifting from shrimp farming to crab farming. The closest market is four kilometers away, and families relied on this market for much of their rice, fruits, vegetables and other key goods such as oil and spices.

Image 3.3: Cattle Grazing on the Side of Ghers in Hurka Village

Source: Author

Due, in part, to the extensive aquaculture, the village has significant salinity issues, affecting both the land and the ground water. However, Hurka village was one of the few villages in the area with deep tube wells installed. Key issues included poverty, a virus in aquaculture ponds, little to no crop or vegetable production, poor roads, and difficult access to drinking water.

Cyclones Aila and Sidr caused flooding, uprooted trees, and destroyed homes. People took shelter in their homes, as well as a nearby electricity booster station. The village is now home to a primary school that doubles as a cyclone shelter, built in 2009, after the cyclones.

The village is close to the site of the proposed Rampal power plant, a coal-fired power plant in development by the Bangladesh and Indian governments. This project is controversial, as the plant is within 15 kilometres of the Sundurbans forest, contravening legislation designed to protect sensitive ecosystems. An access road to the plant was built over the course of the research, with a number of families losing land for insufficient compensation (see Image 3.4).

Image 3.4: Power Plant Access Road in Hurka Village

Source: Author

Fourteen interviews were conducted in Hurka, including nine women, six men, and twenty-seven people in focus groups. We also conducted interviews with members of the local government and some NGOs working in and around the village. We conducted four focus groups, including two focus groups with women, one with men farmers, and a follow-up focus group with women the following year. We also interviewed 18 people in the local ward level Disaster Management Committee.

Chitolmari, Chitolmari

Chitolmari village, in the Chitolmari Upazila, was 50 kms east from Khulna, and located within an embankment. All the people who were interviewed here identified as Muslim. Salinity was an issue in the 1990s, and people introduced salt and fresh water shrimp at this time. However, the construction of an embankment by the government resulted in a decline in salinity, but had also cut canal access to the local river, with no running water in the village.

The families now pursued a combination of rice, fresh water shrimp, and a range of cash crops, including dahl, wheat, sesame and sunflowers (see Chapter Seven). The ground water, while free from salinity, was affected by iron, and for some wells, arsenic. The village also had no electrification, despite numerous applications to the Upazila Government Office. Without electricity, community members were unable to access technologies such as water pumps, or electric filters to filter the iron. Rain water harvesting was limited. The village was affected by cyclone Aila, but not to a major extent.

Sunflowers were introduced by a large local NGO in 2013, specifically as a climate change adaptation initiative, as they are considered drought- and salt-tolerant, while providing for a diversification of incomes (see Image 3.5). This is discussed further in Chapter Seven.

Six interviews were conducted in Chitolmari, including four men and three women, as well as an NGO staff member, and members of the local government. We conducted three focus groups in total – a men's focus group, and women's focus group, and a mixed focus group during the follow-up visit, connecting with twenty-two people.

Image 3.5: Sunflowers in Chitolmari

Source: Author

Mixed Qualitative Methods

Within these case study villages, and number of qualitative and participatory methods were used, with a view to enhancing the 'intensive' nature of the research process and in order to gather rich, contextual details and descriptions. Interviews and focus groups are detailed in Table 3.2.

Table 3.2: Focus Groups and Participatory Methods

Baintola		
Semi-Structured Interviews	18 Interviews with 18 Women, 3 Men, Local Woman Doctor & NGO Field Staff	See Appendix A for questions
Focus Groups	9 Men	Hazard ranking Open questions and discussion
	5 Women	Hazard ranking Timeline Open questions and discussion
	7 Women	Social norm change Gendered roles Open questions and discussion
	4 Women and 1 Man	Sharing and feedback Open questions and discussion
Hurka		
Semi-Structured Interviews	13 Interviews with 9 Women & 6 Men	See Appendix A for questions
Focus Groups	12 Men	Timeline Hazard ranking Open questions and discussion
	15 Women	Hazard ranking Open questions and discussion
	5 Women	Social norm change Gendered roles Open questions and discussion
	7 Women	Sharing and feedback Open questions and discussion
	8 Women and 10 Men (Hurka DMC)	Open questions and discussion
Fakirhat		
Semi-Structured Interviews	13 Interviews with 12 Women & 3 Men	See Appendix A for questions
Focus Groups	8 Men	Hazard ranking Open questions and discussion
	6 Women	Hazard ranking Open questions and discussion
	8 Women	Social norm change Gendered roles

		Open questions and discussion
	8 Women	Sharing and feedback Open questions and discussion
Chitolmari		
Semi-Structured Interviews	5 Interviews with 4 Men & 3 Women and local NGO Field Staff	See Appendix A for questions
Focus Groups	10 Men	Hazard ranking Social norm change Gendered roles Open questions and discussion
	11 Women	Hazard ranking Social norm change Gendered roles Open questions and discussion
	4 Men and 3 Women	Sharing and feedback Open questions and discussion
Dhaka		
Semi-Structured Interviews	8 Interviews with 10 people	See Appendix B for questions
Khulna		
Semi-Structured Interviews	24 Interviews with 27 people	See Appendix B for questions
Summary		
	Village Level Participants Interviewed = 58 **Village Level Focus Group Participants = 123** **Institutional Representatives Interviewed = 37**	

Source: Author

Focus Groups

Focus groups provide a tool for examining group dynamics and relationships around particular issues (May, 2011). Focus group discussions are particularly valuable for understanding "the range of opinions, knowledge, level of awareness, feelings, attitudes, experiences, reported practices, problems and fears that people have about the topic of inquiry" (Colucci, 2008: 235) as well as for understanding normative understandings and collective judgement. In relation to methodology, focus groups allow collective discussion of structural factors and generative mechanisms in a way that seeks to give power to those people experiencing hardship and change (Johnson, 1996). They provided the opportunity for the collection of rich details regarding the case study communities, and processes of both social and environmental change. In addition, early focus groups functioned as a pre-research tool (Sarantakos, 2013), helping provide introductory information regarding the case study

villages to inform interviews, as well as providing a forum for discussion, and the use of participatory tools. Later focus groups explored changing norms, changing farming practices, and gender relationships in more detail.

As Colucci (2008: 236) writes, focus groups require a consideration of "ethnocultrual variables", which include sampling, group compositions, physical seating arrangements, and the reflexivity of the facilitators. To overcome potential gendered power relations, we sought to conduct gendered focus groups, with men and women separately, in order to create environments within which people felt comfortable to speak – although, as discussed further with regards to reflexivity, this was at times challenging. Focus groups were conducted in shared courtyards, or at times in the porch section of people's homes, depending on the participants' requests and desires. In Fakirhat and Hurka, for example, a number of focus groups were conducted at the village ashram, as a central area where people gathered regularly. In Baintola, focus groups were conducted at the home of one women, where women met regularly to take part in handicrafts work – many women would work as we spoke. While these arrangements demonstrate a sensitivity to gender and cultural expectations, this does in a way re-enforce gendered divisions, rather than working towards more transformative settings. Early focus groups were also a space of learning and trust building, which helped to set up connections of the duration of fieldwork.

In each of the case study villages, we conducted three to four focus groups – an initial focus group with men participants, and initial focus group with women participants, and a follow-up focus group with women participants. The exception was in Chitolmari, where time and travel constraints meant that only one focus group with women was held. For each focus group, participants were gathered with the help of a key person within the village. Focus groups included between five and 15 people, with some people leaving and joining over the course of an hour.

The focus groups combined a number of elements and opened a space for the introduction of a number of participatory tools. The focus groups included the following elements:

- An opening introduction for myself, my research assistant, the project and the men and women taking part
- Discussion regarding ethics: informed consent and voluntary participation, confidentiality, the use of data, and opportunities for questions

- A series of participatory activities, outlined in Table 3.2, and discussed in more detail below.
- Open questions and group discussion.

Participatory Methods

Participatory methods sit within a broader commitment to collaborative research, described by McNamara and McNamara (2012) as research that focuses on research designed to inform and assist participants, with participants engaged throughout the research process. Participatory approaches engage participants in the process of knowledge creation (Sultana, 2007a) through sharing, learning and analysis (Chambers, 1997; FAO, 2013). As Berkes and Jolly (2001) argue, complex, local issues such as environmental change require methodologies which involve collaborating with communities to produce knowledge situated in local understanding. Participatory approaches align with critical realist methodology, 'critical' in the sense that knowledge is acknowledged as "socially constructed on the basis of culture, power and inequality" (Murphey, 2002: 323). Participatory methods also align with feminist, reflexive, approaches to research, embedding awareness of potential power relations in the research process, repositioning researchers as facilitators, while acknowledging the agency and capacity of participants. The methods chosen are widely used in climate change and community-based adaptation work (CARE International, 2012; FAO, 2013), and included: time-lining, issues ranking, social norm change mapping, gendered tasks maps, as well as participant observation.

Timelines

The creation of timelines gathered community perceptions on local climate and environmental changes over a period of time (Reid et al., 2009), which was aggregated with government and other data, to help investigate research question one. Participants were asked to reflect over the past 30 years and list major environmental events, which were compiled on a page or whiteboard. Time-lining was particularly useful since case studies are often limited in their ability to produce longitudinal data (Perry, 2011). Timelines were conducted in early focus groups in each of the villages, in order to establish major environmental, and other events, which were considered important by participants. These were used to build a picture

of environmental and agricultural change in each of the villages, to help understand the underlying causes of key changes, which linked to broader political and agricultural forces.

Issues Ranking

Issues ranking determined community perceptions of environmental and other issues (Reid et al., 2009; Roy, Jahan, & Hulme, 2012), and allowed community members to highlight changes and challenges most significant to them, to help investigate research questions one and two. In early focus groups, community members were asked to 'brainstorm' key environmental, agricultural and farming issues that they were facing. All issues mentioned were written on a card. After listing key issues facing the community, participants were asked to nominate those challenges they considered most pressing, which were arranged on a piece of butcher's paper. As issues were considered, we asked participants to consider these issues in relation to those already ranked. From here, we were able to ask questions about the nature of various issues, and why they were considered important or otherwise. These details were added to the cards as the conversation progressed. This activity allowed for a focus on local perceptions of risk and change. Data were used to refine interview schedules, in order to ensure that the concerns that community members identified were being appropriately considered. See Image 3.6 for an example from Baintola.

Image 3.6: Issues Ranking from a Focus Group with Women in Baintola

Source: Author

Social Norm Change

Social norm change activities were used to understand processes of change that had occurred in the villages with regards to social norms, farming practices and gendered divisions of labor, to help investigate research questions two and three. A social norm change activity was conducted in each of the villages in later focus groups. Since this activity required discussion of more sensitive topics, carrying this out in later focus groups meant that we had built relationships of trust with people over the preceding months, making space for more in-depth discussions. This method was also incorporated after discussions with staff at CARE Bangladesh, who suggested that insights regarding social norms would allow for understandings of the ways in which social norms can, and do, change. Such a perspective is also consistent with feminist research methodologies. The social norm change activity that we used is adapted from an activity developed by the CARE Bangladesh 'Social Analysis and Learning Team' (SALT). In focus groups, participants were asked to brainstorm key social practices, with our suggestions, including:

- Shrimp farming
- Use of hybrid seeds
- Vegetable Farming
- Rice Farming

- Girls' education
- Women working outside of the home
- Women working on farms
- Salinity
- Domestic Violence
- Early Marriage
- Dowry
- Use of mobile phones.

As seen in Image 3.7, using pie graph symbols as an indicator of prevalence, women were asked to consider how prevalent these norms and activities were 20 years ago, 10 years ago, and today. Rather than being used as a factual measure of change over time, this symbolic mapping was used to begin discussions around how and why practices had changed – such analysis aligns with Chafetz's (1990) claim that feminist theory acknowledges the mutability of gender norms over time.

Image 3.7: Social Norm Change Activity in Chitolmari

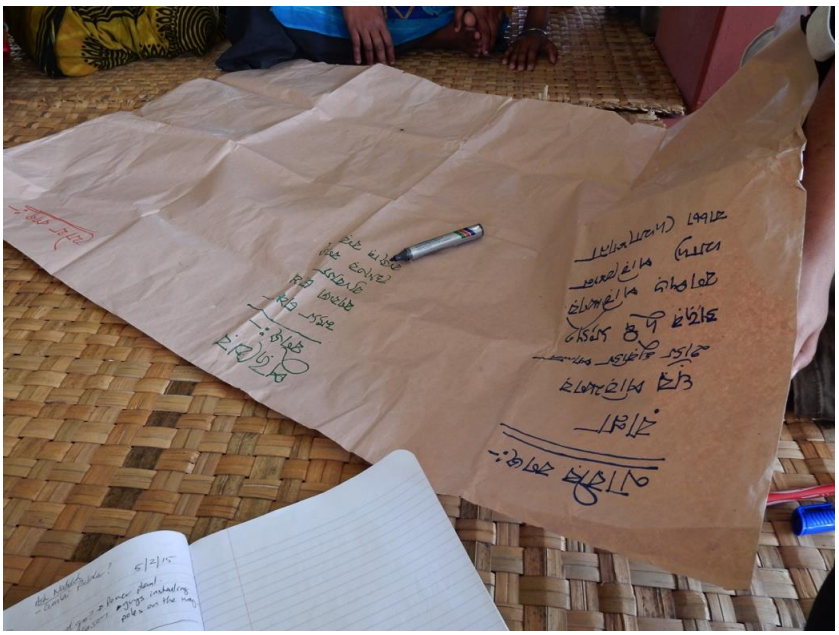
Source: Author

Gendered Task Maps

In order to generate discussion regarding gendered divisions of labour, women compile tables of gendered tasks, to help investigate research question two and three. This activity is adapted

from tools such as daily activity clocks (FAO, 2013) to understand the spread of workloads between different groups. In focus groups, women were asked to consider the key tasks that they and their families engaged in each day, and at different times of the year, and categorise these tasks according to whether they are usually carried out by women, by men, or considered to be a shared task. As women spoke, these tasks were written up on a sheet by the research assistant (see Image 3.8). These maps were then used to prompt discussion regarding the underlying reasons for gendered divisions of labour, and the status afforded to women in agricultural and material spaces. This task aligns with Allen and Sachs (2007) theorising regarding the gendered nature of food and agriculture, allowing insight into the socio-cultural, material and corporeal domains of food, and the ways in which women are constrained or enact agency in each domain.

Image 3.8: Gendered Task Map being prepared in Fakirhat



Source: Author

Participant Observations

As Hughes and Sharrock (2007) write, participant observations allow for the generation of rich, experiential and contextual information on the lives of participants, and are complimentary to interviews. Observations are particularly relevant for understanding the interactions between people, social norms, environments and farming practices. In ongoing visits to each of the villages over a total of five months, we were able to observe the environments, patterns of agriculture, divisions of labour and the impact of external interventions, and engage in ad-hoc tours of farms and villages with participants. Key

observations were used to inform subsequent interviews and focus groups, as well as enhancing interview data. These observations were often guided by participants. In Fakirhat, we were invited to join two women in the rice fields as they cut rice for transplanting. They said to us, "*You have to work [on your research], we have to work too*" [Fakirhat, 7]. This allowed for a deeper understanding of the ways in which women embodied roles between socio-cultural and material domains, and their engagements with agricultural ecologies. In Hurka, we observed the installation of power poles along the main road, which opened discussion regarding the development of a nearby power plant, which had yet to be discussed in interviews. Photographs taken during participant observations and interviews are also used to illustrate the findings and discussion chapters (see below section on photographs).

Semi-Structured Interviews

With the assistance of my research assistant, I conducted semi-structures interviews with community-members in the case-study villages, as well as institutional representatives. Semi-structured interviews have been used extensively in feminist and political ecology research, often in combination with other qualitative methods (see Bee, 2013 and Sultana, 2006) as they open opportunities for participants to frame phenomena while incorporating theoretical considerations (Galletta & Cross, 2013). Interviews gathered data that goes beyond individual details, to provide information regarding broader and underlying social factors (Hughes & Sharrock, 2007) with questions on the environment, agriculture, political engagement and gender relations. Interviews were also designed to build upon information gathered at focus groups and participatory methods, to allow for greater detail regarding families and individuals in the four communities, to help investigate research question one, two and three. We interviewed between eight and 21 people in each of the case study villages, with a total of 59 people interviewed. Interviews were conducted in Bangla, and Naoshin translated questions and answers.

Identification of potential participants began at focus groups, and continued throughout, with a purposive sampling approach, based on known characteristics (David & Sutton, 2011), as well as snowball sampling. Sampling focused on women, farming families, those involved with adaptation initiatives and who were interested in taking part. We also interviewed community leaders, doctors, teachers, and NGO staff.

Following a semi-structured format, interviews began with a set of questions regarding environmental changes, food security within households, gendered roles and responsibilities, and adaptation decisions (see Appendix A). The semi-structured nature allowed for flexibility, based on participant's insights and ideas, and based on findings from focus groups and observations. Interviewees were again asked at the close of interviews if they were happy for me to use their insights in my thesis and other documents, and were then asked if they had any questions for us.

As Hughes and Sharrock (2007) argue, interviews are a social process and as such, efforts were made to build connections and relationships with interview participants. Many people we had already met in focus groups. As such, we were familiar to each other prior to the interviews and participants were aware of the nature of the research. Informed consent was confirmed for each participant, and interviews were either recorded with an audio recorder, or with notes. I also took photographs of homes, people and farms. Interviews took place at people's homes, in shared courtyards, and at times in the fields, and took from between 30 minutes to an hour. I was also mindful of my "embodied situatedness" (Sultana, 2007a: 379) in relation to participants, in terms of symbolic gestures of hospitality and deference – these "everyday acts" (Sultana, 2007a: 379) can emerge as sites of "microethics" (Guillemin & Gillam, 2004: 265). I sat on mats on the ground with participants when I could, on chairs or stools when appropriate, and accepted food and water when offered. My lack of in-depth language skills was a significant impediment, however, I tried to engage in various parts of interviews in Bangla, to acknowledge the importance of the language and to connect with participants.

Institutional Representatives

We also conducted interviews with a number of institutional representatives in Khulna and in Dhaka. I have selected the term 'institutional representatives' over the commonly used 'key informants' in order address perceived knowledge and power imbalances between participants at the local level and the meso level.

Sampling of institutional representatives also followed a purposive approach, with access negotiated with assistance from local NGOs. This purposive approach was based on the aim

to interview people who were involved with structural elements of governance, resource management and adaptation in the region. As such, we interviewed local government representatives, extension officers, national departmental officials, as well as NGO staff members working in the villages. We conducted 32 institutional representative interviews over the initial and follow-up stages of fieldwork, including individual and group interviews with 27 people in and around Khulna, and 10 in Dhaka. Participants were asked to confirm informed consent, and interviews were recorded digitally, or through notes, depending on the wishes of participants.

These interviews were also semi-structured, with questions regarding climate change, policy, institutional responses and ideas regarding the meaning and purpose of adaptation (see Appendix B). This format allowed us to ask representatives to reflect on findings that were being generated in the field – for example, asking local government representatives to reflect on low levels of knowledge regarding climate, or to provide details as to the causes of environmental changes observed.

Informed Consent, Confidentiality and Ethical Obligations

Informed consent was an important part of the research process, and part of building connections with research participants. Ethical approval was sought via the University of Queensland Behavioural and Social Sciences Ethical Review Committee prior to research commencing (see Appendix C). To ensure that informed consent was being gathered appropriately, and participants had a full understanding of the project, the early stages of fieldwork involved in-depth conversations with my research assistant, and ongoing conversations regarding the importance of informed consent. Each interview and focus group began with a conversation regarding the nature of the research, my role as a student, and confidentiality. This was important, as there was a times confusion regarding my role and my relationship with local NGOs. One participant told me there was a rumour that I was auditing the local NGO, and some people said they had initially thought I was starting a project. My identity in the field was connected to that of other researchers who had come before me, and as such, discussions regarding the project, the thesis, ethics and my role as a student were crucial. Being accompanied by Naoshin helped to address some of the challenges associated with myself as a young, educated and foreign women, from a country well known as a donor

in the region, while being mindful of the way we were being "positioned" by participants and others in the field (Sultana, 2007a: 379).

Once the nature of the project was established, I asked people if they were comfortable to give informed consent to take part in the project. Where possible, this involved signing informed consent forms. For most interviews and focus groups, this involved oral consent, and the recording of people's names. At the end of interviews and focus groups, we again re-iterated the nature of the project, and asked people if they were happy for the insights they had shared to be used in my research. Shompa in Fakirhat, for example, was thankful, stating that many NGOs come to the village to gather information, but none ever ask for permission in this way [Fakirhat, 8]. As a gesture of reciprocity, we offered participants fruits and snacks at the end of each interview and focus group. This was often reciprocated by participants themselves, a number of whom offered us water, fresh fruit, and in a few cases, hot lunches – accepting these gifts was part of building relationships and rapport (Liamputtong, 2008).

In terms of moral obligations, many people asked what I would be able to do with this research that would be of any use to them. While stressing that there may not be any tangible benefits, I did say that I would be sharing the results with local NGOs, government departments, and other key stakeholders. Many people said that they wanted their stories to be shared with the world, and for people to know about their lives. I have sought to maintain connections with key stakeholders and government officials, with whom I will share research findings. The follow-up visit in January 2016 was also an important part of the social and moral obligation involved with participatory, grassroots fieldwork, and worked to build a relationship of commitment and reciprocity. Many participants expressed surprise, with one woman saying that while many foreigners visit their villages, no one ever returns.

To ensure confidentiality, participants are referred to throughout the thesis by a pseudonym or position title, their location, and the interview number. For example, the first person we spoke with in Baintola is referred to as Nasima [Baintola, 1]. The first institutional representative we spoke with in Khulna is referred to as a government official [Khulna, 1]. In addition, the villages are referred to by the name of the Union they are situated in.

Qualitative Data Analysis

A critical realist approach to data analysis seeks to examine the connections between observed patterns and phenomena, and the generative mechanisms underneath these arrangements. The goal of critical realist research is to explain mechanisms that generate a certain events (Wynn & Williams 2012). In this case, the goal is to explain the experiences of environmental change and adaptation for communities in Southwest Bangladesh, with attention to the ways in which gender functions as a generative mechanism for engagement with agricultural environments.

In a practical sense, the analysis was driven by a number of theoretical themes, which helped to guide readings and interpretations of data (Braun & Clarke, 2006). As Olsen (2004: 146) writes, critical realism reflects "on the values implicit or explicit in theoretical frameworks as well as empirical data". In particular, adaptive capacity vulnerability theory engages closely with generative mechanisms which underlie vulnerability, considering the mechanisms that create vulnerability. These include environmental mechanisms – climate change, water and agricultural interventions – as well as social mechanisms, including gendered inequality, governance and poverty. This theory is consistent with critical realism in providing a conceptual bridge between the experiences of communities regarding climate change, salinity and changes in farming practices, and the social, political and economic structures that create these experiences.

Data consisted of interview transcripts, which had been transcribed and translated into English from Bangla, as well as field notes from interviews, observations and meetings, visual and written data from participatory activities and photographs. An initial review of the data was done using NVivo, and this process allowed for early codes, ideas and themes to be identified. This initial analysis followed an inductive thematic approach, described as "identifying, analysing, and reporting patterns (themes) within data" (Braun & Clarke, 2006: 6). The themes that emerged are a combination of semantic and latent themes, some of which have come directly from what participants said, while others involved analysis drawn from wider theories, and knowledge of the context (Braun & Clarke, 2006). A key example of this is the evidence of climate change in the case study villages – while people did not know what climate change meant, I was able to draw on their reports of environmental changes, and link this to broader data, literature and theory.

From this initial thematic coding, I engaged in a process of 'retroduction', a process of analysis whereby consideration is given to the underlying mechanisms that must exist for a particular patterns of outcomes to be observed (Hart, New and Freeman, 2004), a key tool in critical realist research. Each of the three findings chapters documents a process of retroduction. In Chapter Five I explore the underlying mechanisms – biophysical and social – creating conditions of exposure and sensitivity, with findings regarding the links between climate change, and the negative outcomes of policy and agricultural interventions. In Chapter Six, I consider what underlying mechanisms were contributing to vulnerability and adaptive capacity, guided by social justice (Schlosberg, 2012), adaptive capacity theory (Wright, Kristjanson, & Bhatta, 2012) and capabilities theory (Pritchard et al., 2013). Finally, I considered those adaptation initiatives observed, arguing that given the exposure, sensitivity and challenges to adaptive capacity found in Chapters Five and Six, and guided by feminist theories on 'practical' and 'strategic' gender needs (Moser, 1989), initiatives are at times are reproducing the structural conditions that create vulnerability. Data are represented using narratives drawn from interviews and field notes, quotes, photographs, and tables drawn from focus groups and participatory activities, with reference to key policies, documents, literature and theory.

As discussed, the research design integrated a number of village level case studies as "embedded units of analysis" (Yin, 2014: 167) within a wider case of Southwest Bangladesh. As such, the village case studies contribute towards a cross-case synthesis, drawn together to identify key structural elements common across the villages, to describe an integrated case. Analysis required moving back-and-forth between individual cases and the broader context, to identify common patterns, themes and ideas. The presentation of data includes both presentation of individual cases – in the form of tables, narratives, photographs and descriptions – which are drawn together in discussion and analysis. This allows for the identification of locally-specific generative mechanisms, as well as the identification of broader generative mechanisms, or broader political economies affecting the capacity of communities to adapt (see Chapter Six).

The photographs that were taken in the field and included in the thesis, have been used for illustrative and descriptive purposes. I took photos in the villages, and the wider case-study region, during interviews, focus groups, observations and walks through the village, photographing farming practices, home work, animals, agricultural landscapes and people. As

well as recording the fieldwork, photography was also a tool for building relationships. I sought permission from subjects in the photos and was, at times, directed to take photos of significant scenes. The photographs have been useful not only in complementing field notes and data, but also for sharing findings in presentations and discussions, both in Bangladesh and in Australia, to help communicate key themes, as well as the complexity and vibrancy of life in Southwest Bangladesh. I have been mindful of the ways in which participants and landscapes are represented, in consideration of confidentiality.

Summary and Conclusions

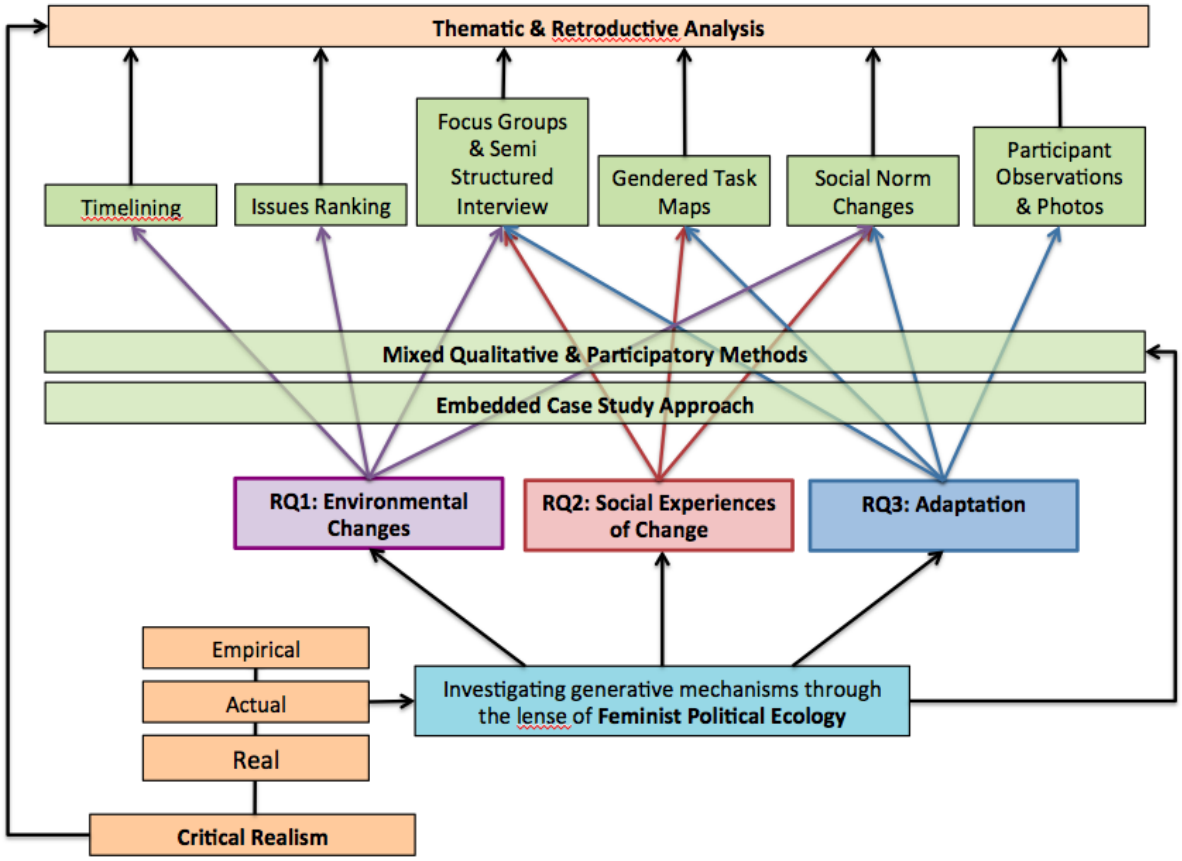
In order to consider the interactions between environmental changes, social inequalities, and the function of gender, this chapter has outlined a case-study based research process that draws from feminist methodologies, political ecology, and cross-cultural research.

A critical realist methodology draws together a realist ontology, based on the functions of generative mechanisms, with an epistemology that acknowledges the partial and socially constructed nature of knowledge and theory. This builds a foundation for engagement with key ideas drawn from feminist political ecology, and broader branches of political ecology, whereby the social and the natural are engaged in processes of mutual influence and meaning-making. Importantly, this methodology allows for close consideration of the ways in which environmental conditions influence and are influenced by the creation and re-creation of social inequalities, including gender, poverty and political marginalisation.

Consistent with a critical realist focus upon ‘intensive’ and contextually-bound data gathering processes, an integrated case study design was developed, with a series of four case studies within a broader analytical field of Southwest Bangladesh. Fieldwork, consisting of a four month period, followed by a one-month follow-up visit the following year, involved the use of interviews, focus groups, and participatory tools in the case study villages, as well as interviews with institutional representatives who help to provide macro-level details and reflections. Participatory tools sought to engage participants in ways that acknowledge agency, local knowledge and reflexive engagement. These methods allowed for the generation of rich, contextual data regarding community concerns, social norms and changes over time. Analysis of interviews, focus groups, participatory data and field notes followed a

thematic analysis process, followed by the application of 'retroduction', being analysis that moves backwards from phenomena to consider underlying structures and causal mechanisms. Figure 3.3 below outlines the methodological framework.

Figure 3.3: Methodological Framework



Source: Author

The following Chapter Four provides a discussion of the broader context of Bagerhat, while Chapters Five, Six and Seven consider the findings generated through the processes described here, applying the theoretical frameworks of adaptive capacity theory, climate justice and capabilities theory to understand environmental change and adaptation in Southwest Bangladesh.

Chapter Four: The Political Ecology of Southwest Bangladesh

Introduction

In this chapter, I discuss the political ecological of the Southwest of Bangladesh, with a focus in Bagerhat, outlining background literature on four key themes, 1) the governance and political economy of climate change in Bangladesh, 2) climate change and the political ecology of Bagerhat, 3) the history of adaptation in Bangladesh, and 4) gender relations in the country. This overview provides context for the theoretical framework outlined in Chapter Two, including the ways in which gender relations are situated within a broader institutional context and ecologies, through which entitlements, resources and capabilities are "formed, contested and distributed" (Adger & Kelly, 1999: 256). In addition, an embedded case study approach to the research (see Chapter Three), requires an understanding of the contextual basis of the case study villages, and the broader Southwest region.

I begin with an overview of the broader political economy, and processes of neoliberal economic growth in Bangladesh. Governance in Bangladesh continues to suffer from centralisation, corruption and barriers to women's involvement, which limit opportunities in terms of political and material entitlements. I then go on to discuss climate change as a political and ecological issue, causing a range of significant environmental hazards, including salinity, waterlogging, cyclones and storms, storm surges and flooding. The environmental issues facing the case study region, Bagerhat, are situated within this broader environment – Bagerhat is expereincing a range of environmental challenges, in particular, salinity, with causes that are both ecological and political. The governance environment surrounding climate change in Bangladesh seeks to pursue economic growth, which addressing climate change from a technocratic perspective; the Bangladesh Climate Change Strategy and Action Plan, the key policy that covers adaptation in Bangladesh, suffers from limitations in procedural justice, led by a largely hazard-centric understanding of vulnerability. Often excluded is consideration of the locally-bound nature of many of the challenges facing the Southwest. I then go on to discuss broader approaches to adaptation in Bangladesh, arguing that these responses have been largely hazard-centric in nature. As these key points suggest,

there has been a lack of consideration of the social factors and structural issues that constitute vulnerability. Finally, I consider the broad indicators of gender inequality in Bangladesh, with a particular focus on the ways in which gender impacts on agricultural divisions of labour, and interactions with natural environments, to help contextualise issues regarding gender relations.

National Governance and Political Economy

Bangladesh, as a nation, emerged from a war of independence in 1971. The conflict and preceding period of colonial domination continues to influence political, economic and social relations today. A history of colonisation has depleted natural and economic resources, with periods of famine, political instability and violent conflict. Following the partition of India and Pakistan in 1947, Bangladesh became East Pakistan. This was followed by a period of economic and political marginalisation at the hands of West Pakistani authorities. The Awami League party, which continues to play a central role in Bangladesh politics, led an independence movement united under a secular, Bengali, national identity, with language as a binding force. A violent war of independence in 1971, won with the support of India, was followed by a famine and mass movements of people between India and Bangladesh. By the 1980s, Bangladesh was receiving huge amounts of international aid, leading to a wide proliferation of NGOs and civil sector actors. Politics in the country has since endured a military coup in 1979, waves of Islamic extremism, military rule and caretaker government, before moving towards a democratic system. Affiliation to the major parties, the Awami League, and the Bangladesh National Party (BNP) drives clientelism at all levels of government. More recently, the rise of international terrorism has shaken the country, with violent attacks on Bangladeshis and foreigners, as well as violence surrounding elections.

Bangladesh faces widespread poverty. The World Bank (2017) reports that 18 per cent of the population live below the extreme poverty line (USD$1.90 per day), while around 31 per cent of people live below the national poverty line, which includes data on income as well as education and health. Some 80 per cent of the population live in rural areas, where the rate of poverty is also higher (Seferiadis, Cummings, Maas, Bunders, & Zweekhorst, 2017). Structural inequality remains high. Ambitions to reduce widespread poverty are likely to be

hampered by the impacts of climate change (Parvin & Johnson, 2015), while many people experiencing poverty are likely to feel the impacts of climate change more acutely.

However, Bangladesh has made significant gains in key social and economic indicators over the past 45 years. Gender parity in primary education has been achieved, along with a decline in infant mortality, and a slow-down in population growth (Mahmud & Mahmud, 2014). Economic growth since the 1990s has been driven primarily by the garments industry, relying in particular on women workers on low wages (Mahmud, Ahmed, & Mahajan, 2008). Other major contributors to economic growth have been remittances from migrant workers, construction, growth in agriculture, services and the informal sector (Mahmud et al., 2008); however, this wealth has been significantly unequally distributed, with a wide income gap. These social changes have occurred despite ongoing weaknesses in national and local governance in Bangladesh, including a centralised administration, corruption, a lack of unionization, limiting the capacity for collective action, and patronage politics, being the exchange of resources for political support and benefits (Ahmed, Greenleaf, & Sacks, 2014; Mahmud et al., 2008; Mahmud & Mahmud, 2014). Elections are frequently beset by violence, and there is a lack of meaningful dialogue between the two major parties, what Jahan (2014: 265) describes as a "toxic confrontational culture" based on ideology. Despite local government being an important part of the political landscape in Bangladesh, centralisation has stymied genuine local democratic governance, and local governments similarly struggle with corruption and patterns of patronage and lack of accountability (Sarker, 2006). Farming communities in Bangladesh, however, have frequently engaged in at times violent struggles against "the capitalist bias of the state", including struggles against coal mining (Misra, 2016: 6) and struggles against the shrimp industry (Deb, 1998).

Bangladesh is home to approximately 23,000 registered NGOs, with NGOs forming an important, and often contradictory part of the political process, including at times delivering essential services that are usually the responsibility of the state (Haque, 2002). A strong focus on non-government actors by external donors has done little to address power inequalities from which poor people may benefit, and corruption within the NGO sector may similarly be contributing the "reproduction of poverty" (Davis & Mcgregor, 2000: 51).

Bangladesh was one of the first countries to engage in processes of structural adjustment in the 1980s, which included processes of trade and export liberalization and privatization, and

cutbacks in the public sector, with a view to building economic growth (Bhattacharya, Rahman, & Khatun, 1999), by enhancing private-sector led, export-oriented

industrialisation, and shifting away from agriculture (Misra, 2016). Despite ongoing processes of economic liberalization, agriculture and subsistence remain central to Bangladesh's economic, political and social systems (Misra, 2016). The growth of the export shrimp sector (discussed further below) was born in part out of structural adjustment, driven by a range of economic policies that attracted private investment (Bhattacharya et al., 1999). The results have included environmental damage (Bhattacharya et al., 1999) and significant social and economic inequities, including physical and political violence and land grabbing (Pouliotte et al., 2009). The Green Revolution in the 1980s encouraged the use of new seed varieties, chemicals and irrigation to increase farm production, drawing subsistence farmers into agricultural markets, while increasing the cost of inputs (Misra, 2016).

Climate Change in Bangladesh

National-level environmental and social changes in Bangladesh sit within a broader global environmental context of climate change. The interactions between local and global changes are not well understood, indicating the need for an approach to vulnerability and adaptation that considers these interactions and the political process, which have engendered them.

Climate change is the result of industrialisation, a rapid process of change in technology, human societies and relationships with nature (Beck, 2010), a manifestation of the unequal processes of modernisation. Human-induced greenhouse gas emissions have resulted in increased concentrations of carbon dioxide and other gases which trap heat within the atmosphere, increasing average global temperatures. The impacts of climate change are wide reaching, multidimensional and systemic, with immediate impacts on water and food production having flow of effects for food security, health, inequality, economic and political stability (Khan, 2010).

In applying the adaptive capacity framework, the vulnerability of a country to climate change is linked to geophysical exposure, as well as socioeconomic and social conditions (Khan, 2010). In terms of exposure, the Southwest is already prone to a range of environmental hazards, including cyclones and flooding (Karim & Mimura, 2008). Bangladesh is positioned

between the vast Ganges-Brahmaputra-Meghna (GMB) water basin, and the shallow Bay of Bengal, within the Himalayan monsoon belt. Topographically, two-thirds of the nation is less than five meters above (The World Bank, 2010). Much of the country is low-lying and prone to flooding, with up to 25 per cent of the country experiencing flooding each year (Ahmed, Occhipinti-Ambrogi, & Muir, 2013). Monsoons are often followed by periods of drought in the dry season. The country has a history of devastating cyclones, with significant deaths. While Bangladesh receives only one per cent of global cyclones, the country has experienced 50 per cent of casualties globally (Alam & Dominey-Howes, 2015). This is partly the result of high exposure – the geographic characteristics of the Bay of Bengal traps cyclones, while a low continental shelf amplifies the impact of storm surges (Yu et al., 2012). There have also been historical limitation in storm warning systems (Alam & Dominey-Howes, 2015). A large cyclone in 1970 was estimated to have killed 266,667 people; Cyclone Gorky in 1991 killed 139,866 people; Sidr in 2007 killed 4,234 people; Aila in 2009 killed around 200 people. While deaths have decreased significantly, as a result of improved warning systems and cyclone shelters, economic damage and displacement has increased (Alam & Dominey-Howes, 2015).

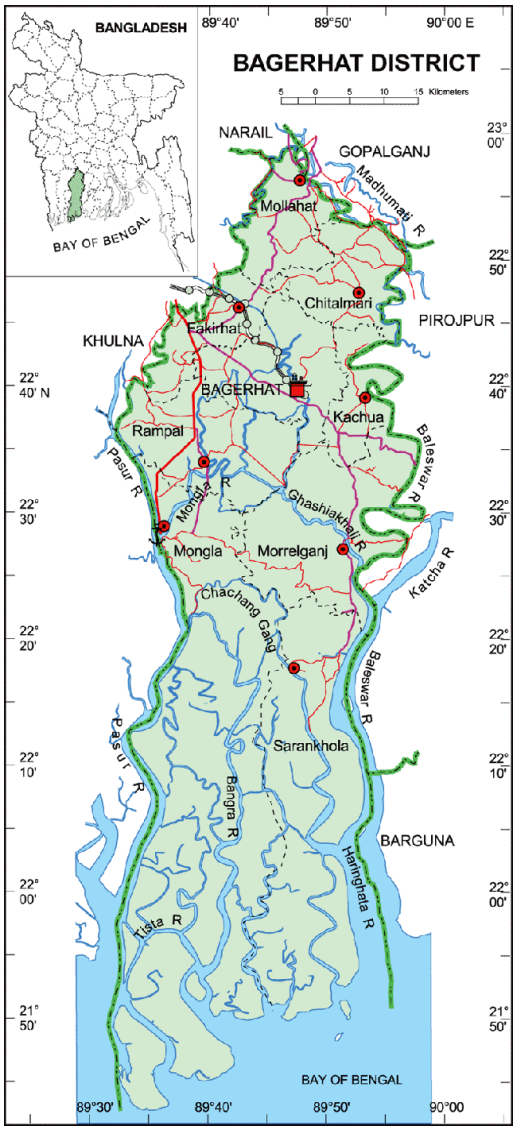
Climate change is expected to exacerbate many of these existing environmental patterns. Temperatures changes include higher temperatures during the monsoon period, and cooler temperatures in the pre-monsoon period (Huq, Rahman & Konate, 2003). Increase monsoonal rainfall would likely lead to flooding, followed by reduce rainfall and drought during the dry season (Huq et al., 2003; A. L. Khan, 2012[3]). Increased sea-surface temperature is likely to lead to increased frequency of cyclones, floods, storms and tidal surges (Ahmed et al., 2013; Alam & Dominey-Howes, 2015; Karim & Mimura, 2008). Sea level rise and storm surges are predicted to increase salinity (Ahmed et al., 2013). The population density in Bangladesh means that disasters, including sea level rise, floods and drought, would affect up to 95 per cent of the population (Huq et al., 2003). These changes would also put pressure on access to food and water, and impact on health in terms of disease – drought and salinity would impact heavily on rice and wheat (Huq et al., 2003).

[3] Referencing note: Both A. L. Khan and M. Z. K. Khan published cited works in 2012. Their initials are used here for clarity.

Environmental Context in Bagerhat

The Bagerhat district, the focus of this research, stretches about 100 kilometres inland from the coast, capturing the Sundarbans forest, numerous rivers, the Mongla Port, one of Bangladesh's two major ports, and a number of historic mosques. The district is home to nearly 1.5 million people, and the capital is Khulna City (see Figure 4.1).

Figure 4.1: Map of Bagerhat



Source: Local Government Enginnering Deparment (2017b)

Bagerhat continues to face a number of challenges in terms of health and access to basic services. In terms of poverty indicators, literacy is at around 59 per cent (UNICEF, 2014). Access to clean water is a major concern (UNICEF, 2014), hampered by salinity, sanitation and limited access to piped water (UNICEF, 2014). Child marriage remains high, at around

70 per cent (UNICEF, 2014). In terms of food security, poverty maps complied by the World Food Programme (WFP), The World Bank and the Bangladesh Bureau of Statistics examine geographical differences in terms of the cost of basic needs, with purchasing power considered to be the major cause of food insecurity in Bangladesh (WFP & The World Bank, 2014). Of the three Upazilas represented in the study, Chitolmari is considered to be the most insecure, with 39 to 49 per cent of people living below the upper poverty line, followed by Rampal (28 to 38 per cent), and then Fakirhat (16 to 27 per cent) (WFP & World Bank, 2013). With just two garment factories in the region (Bangladesh Bureau of Statistics, 2013), Bagerhat is yet to be engaged in the major industrial growth taking place in Bangladesh.

The area is prone to extreme weather. Bagerhat is most at risk of storm and tidal surge flooding. Drought is also a regular occurrence in the pre-monsoon period (Ali, 2006), linked to reductions in river flow as a result of the Farakka Barrage Dam in India (discussed below). In the last ten years, the district has been affected by two major cyclones – Cyclone Sidr in 2007, considered particularly severe in Bagerhat, and Cyclone Aila in 2009, both of which were accompanied by significant tidal surges. Flooding is a regular occurrence in the Southwest – significant floods occurred in 1987, 1988, 1998, 2004 and 2007 – including monsoonal flooding, riverine flooding and storm and tidal surges (A. L. Khan, 2012). The broader Southwest is also considered particularly vulnerable to climate change, including sea level rise, salinity, cyclones, floods, droughts, and changes in temperature and rainfall patterns (Miah, Bari, & Rahman, 2010; Paul, Nath, & Abbas, 2013; Rabbani, Rahman, & Mainuddin, 2013; Shamsuddoha & Chowdhury, 2007). Bagerhat is considered a hotspot of cyclones (The World Bank, 2010). The risks associated with climate change in Bagerhat sit alongside a range of environmental issues that have emerged from political interventions and agricultural trends.

Bagerhat's local economy is dominated by shrimp farming and agriculture. Around 36 per cent of people are involved with agriculture as their main livelihood (Adaptation and Mitigation Knowledge Network, 2015), including rice, wheat and jute (Bangladesh Bureau of Statistics, 2012). The for-export shrimp industry has also become a major part of life in the Southwest. Up to the 1970s, Bagerhat had a low, rice-based agricultural system, due to the extensive spread of *beel* (swampland) (Ito, 2004). Conditions in the area changed rapidly in the late 1980s, as a result of the expansion of the shrimp industry, and the Farakka Barrage, which have both contributed to the accumulation of salinity in Southwest rivers and land

(Faruque et al., 2016; Ito, 2002). Following the success of freshwater shrimp farming in Fakirhat in the 1970s and 1980s, farmers throughout the region began saltwater shrimp farming, suited to salinity, and bolstered by good returns on the international market (Ito, 2002), along with government policies designed to open up the agricultural market – the Blue Revolution. Across Bagerhat, paddy fields have been modified into shrimp ponds known as *ghers*, with over 70 percent of the Southwest under shrimp farming (Huq et al., 2007). Despite having contributed substantially to economic benefits, the industry has resulted in a range of negative ecological impacts (Ahmed, 2013; Datta, Roy, & Hassan, 2007), reducing agro-biodiversity (Faruque et al., 2016; Rahman, Lund, & Bryceson, 2011) and resulting in declines in traditional agriculture (Paul & Røskaft, 2013). Ecologically, shrimp farming requiring saline water has contributed to salinity, and the availability of fresh water (Crow & Sultana, 2002). Some have argued that shrimp farming practices also weakened embankments that were destroyed during cyclone Aila (Dewan, 2014). The industry has also contributed to conflict over land and resources (Deb, 1998; Hamid & Alauddin, 1998), and has encroached on common property and access to water, with wealthier land owners forcibly taking land (Crow & Sultana, 2002). Economic benefits have also been largely concentrated among wealthy elites (Datta et al., 2007).

The impacts of the Green Revolution are also readily apparent in Bagerhat – the introduction of high-yielding varieties of rice and other crops saw significant increases in productivity, but also changes in the environment, with the introduction of embankments (discussed below) (Swapan & Gavin, 2011), irrigation and fertilisers. These changes have also lead to reduced demands for labour, degradation of land and water sources, including ground water (Begum, 2011). Productivity gains are now being threatened by climate change (Davis & Ali, 2014). The Green and Blue Revolutions can be conceptualised within the "commodification of subsistence" (Bernstein, 2010: 49), which Belton (2016: 236) describes as,

> *the process by which peasant producers become incorporated into capitalist circuits of exchange as producers of commodities and sellers of labour, resulting in a deepening dependence on the market for their means of survival, and the emergence of new (often gendered) class divisions.*

Salinity is widely documented as a major environmental challenge in Bangladesh's coastal regions (UNICEF, 2014), where a saline front stretches as far as 100 kilometres inland,

affecting ponds, groundwater and agricultural land (Khan et al., 2011a). The intersecting causes of salinity in the Southwest, indicate the degree to which the region has been affected by interventions based on modernisation and productivism. Salinity is partly the result of natural hydrology – rivers in the Southwest of Bangladesh are tidal, with sea water flowing inland at different levels throughout the day and year (Khan et al., 2011a). Sea surges associated with cyclones and storms, a common occurrence in Southwest Bangladesh, also contribute to salty sea water inflows (Ahmed, Occhipinti-Ambrogi, & Muir, 2013; Karim & Mimura, 2008). Historically, the volume of freshwater flowing into Bangladesh from throughout the GBM basin, has allowed for saline water and salinity to be flushed back out into the Bay of Bengal. However, in the last four decades, changes in rainfall and river flow patterns have allowed for naturally-occurring salt deposits to build up over time, leading to salinity in soil and water along the coast. With reduced flows, there is not sufficient fresh water to wash saline water from rivers and soils (M. Z. K. Khan, 2012[4]). Reduced river flow has also led to a build-up of sediment in rivers, raising riverbeds and preventing drainage of salty water (Pouliotte et al. 2009). Storm surges, which push sea water into land during storms and cyclones, are a common occurrence, and further contribute to the build-up of salinity in the Southwest inflows (Ahmed, Occhipinti-Ambrogi, & Muir, 2013; Karim & Mimura, 2008). The increasing frequency of cyclones, as well as sea level rise (SLR) under climate change, are likely to contribute to higher storm surges and flooding in coastal areas (Vineis, Chan & Khan, 2011). In a country where 60 per cent of the land is less than six meters above sea level (Mirza, 2002), even a small amount of sea level rise could have detrimental effects to land, water and communities. The IPCC have calculated a projected SLR of 9 to 88 centimetres over the next 80 years – an increase of one metre would affect 13 million people directly, and would cause a loss of six per cent of national rice production (Yu et al., 2012). As sea levels rise, this could further decrease flows from rivers, allowing salinity to move further inland (Yu et al., 2012).

The Farakka Barrage dam in India, built in the 1970s, has significantly altered the hydrology of the western river systems in Bangladesh, reducing the flow of fresh water in the dry season, and increasing the flow of water in the wet season (Mirza, 1998). The Farakka Barrage is built above the point at which the Ganges splits through West Bengal, and

[4] Referencing note: Both A. L. Khan and M. Z. K. Khan published cited works in 2012. Their initials are used here for clarity.

Bangladesh, and was unilaterally built by India to help flush siltation from the Hoogley River, in order to maintain the port of Calcutta (Sood & Mathukumalli, 2011). While India initially argued that there would be minimal downstream effects, the 'lean' water months, in April and May saw water crises emerge in Bangladesh (Sood & Mathukumalli, 2011). There has been ongoing conflict over water sharing agreements between the Bangladesh and Indian governments – an agreement for minimum flows of water into Bangladesh were signed in 1977, but expired in 1985, after which time India began to unilaterally extract water. A thirty year treaty was signed in 1996, regulating minimum flows of water for both India and Bangladesh in the dry season, however, these quantities have frequently been undermined for Bangladesh (Kawser & Samad, 2016). In addition, the agreement was based on water quantities which have since declined (Hossain, 1998). The Farakka Barrage has resulted in a number of environmental impacts for the Southwest. Reduced flow from major rivers entering the areas has been a significant factor in allowing for salinity intrusion (Ahmed, 2006). The reduction in the flow of water in the dry season has resulted in an increase in salinity – without sufficient river flow, sea water intrudes up river systems, which would otherwise have been flushed out, allowing for salt water to reach further and further in-land (M. Z. K. Khan, 2012). In addition to salinity, agriculture and forests, including the Sundarbans, have been affected by a loss of access to water and depleted soil moisture (M. Z. K. Khan, 2012; WARPO, 2004), and fish breeding grounds have been affected (Gain & Giupponi, 2014).

Alongside the Farakka Barrage, agricultural and infrastructure interventions have significantly affected ecologies in the Southwest. Population and infrastructure growth has led to reductions in arable land, while agricultural intensification and use of modern crops has deteriorated soils (Hussain & Iqbal, 2011). Arsenic in drinking water – the result of NGO-installed tube wells in the 1970s (Sultana, 2009) – is now present in two thirds of the country (Hussain & Iqbal, 2011). Paprocki (2015) points to the work of Iqbal's (2007), who's research links a number of environmental issues, including river siltation and flooding, to the development of railways in the Southwest in the 1800s and 1900s. With a focus on cost savings over environmental impacts, railway companies filled in lakes, ponds and rivers, built rail embankments with culverts that were too small, and bridge pillars in rivers built up with silt. Iqbal (2007) describes the deterioration of waters systems as a result of these interventions, leading to flooding, crop failures and water logging, as well as loss of navigation and marketing, contributing to serious food insecurity in the mid-1900s. The

construction of polders and embankments have also contributed to processes of salinisation. Polders are low-lying sections on land enclosed by embankments or dykes, designed to allow the entry and exit of water through manually-operated sluice gates. An extensive network of polders and embankments were developed in the 1970s, under government initiatives including the Coastal Embankment Project, to allow for the expansion of farmable land by stopping natural salty tidal flows (Swapan & Gavin, 2011) in order to capitalise on the Green Revolution. While some areas have been protected from salinity, in other areas, this infrastructure has resulted in the inverse effect (Swapan & Gavin, 2011). The embankments have overtime contributed to a build-up of silt in plains and riverbeds, allowing for saline tidal inflows to flow into plains, creating saline-waterlogged land (Faruque et al., 2016; Swapan & Gavin, 2011). Landscape change for shrimp farming over the past three decades has also been widely credited for exacerbating salinity levels. In many areas, large sections of land previously used from rice and other crops, have been converted to shrimp ponds (Pouliotte et al., 2009), capturing saline water and allowing for a build-up of salinity in surrounding areas (Swapan & Gavin, 2011).

Significant heterogeneity exists in terms of environmental conditions in the Southwest. Local agro-ecologies exist around the severity and impact of salinity, depending on local climatic, ecological and agrarian conditions (Faruque et al., 2016). Salinity intrusion is also highly seasonal between the dry and wet seasons. Bangladesh's section of the Ganges now flows less than a quarter of its historical capacity flow during the dry season, due both to damming (Khan et al., 2011a) and now changing rainfall patterns. Salinity is able to accumulate during the dry season, and much research has shown higher levels of salinity in drinking water and soil during the dry season (October to April) (Khan et al., 2011a; M. Z. K. Khan, 2012).

High levels of salt in water from surface ponds and wells has had a range of health implications for individuals, including hypertension and maternal health problems (Khan et al., 2011a), skin problems from bathing in salty water, and diseases including cholera (Ahmed et al., 2013). Women, traditionally in charge of collecting drinking water, are now forced to travel longer distances to find suitable sources (Ahmed et al., 2013) and without clean water, diarrhoea is prevalent in many affected communities (Ahmed et al., 2013). Saline soils are unable to support many of the major crops grown in Bangladesh, including rice, and traditional homestead gardens, providing valuable subsistence, are increasingly difficult to manage (Swapan & Gavin, 2011). This also compromises the co-benefits of rice

farming, including the multi-use of rice straw for housing, fuel and fodder, which has led to reduced rearing of livestock (Ahmed et al., 2013).

Climate Change Governance

The governance of climate change in Bangladesh sits within a broader political economy of economic growth, with industrialisation seen as a path for social and economic development. Bangladesh is often mentioned as being a leader in terms of climate change policy and adaptation (Rai et al., 2014). Bangladesh was one of the first countries to write a National Adaptation Programme of Action (NAPA) as part of the UNFCCC process, later updated in 2009 as the Bangladesh Climate Change Strategy and Action Plan (BCCSAP). However, the BCCSAP is limited in terms of procedural justice, and in incorporating an understanding of underlying causes of vulnerability.

The BCCSAP includes 6 focus areas, or pillars: 1) Food Security, Social Protection & Health; 2) Disaster Management; 3) Infrastructure; 4) Research and Knowledge Management; 5) Mitigation and Low Carbon Development; and 6) Capacity Building and Institutional Strengthening. Within this, there are 44 programs. The policy takes a largely hazard-centric and technocratic approach to vulnerability, which sees vulnerability rooted in biophysical hazards, as opposed to social factors; where social factors are considered, this is largely in the context of poverty reduction (Parvin & Johnson, 2015). Funding for adaptation comes from two main sources – the domestically funded Bangladesh Climate Change Trust Fund (BCCTF) and the multi-lateral funded Bangladesh Climate Change Resilience Fund (BCCRF), administered with input from the World Bank.

Pillars 2, 3 and 4 – Comprehensive Disaster Management, Infrastructure and Research and Knowledge Management – are predominantly top-down and technocratic in nature, and the majority of the adaptation and mitigation measures suggested within the policy are physical, such as embankments, new crops, cyclone shelters and road raising (Parvin & Johnson, 2015). From the BCCTR, significant amounts of funding have been given to infrastructure and embankments. Transparency International (Khan, 2015) have argued that funding via both the BCCTF and the BCCRF have missed the most vulnerable communities, leading to mal-adaptation. On the whole, the BCCSAP takes what Parvin and Johnson (2015: 879)

describe as a “hazard-centric technocratic approach” to vulnerability, with the physical impacts of disasters seen as the key indicator of vulnerability. In addition, the policy focuses on poverty alleviation, working on the assumption that “accelerated development is the most effective way to eradicate poverty and build resilience to climate change” (Parvin & Johnson, 2015: 889). What this overlooks is the “underlying structural system” and “the root causes of disaster vulnerability” (Parvin & Johnson, 2015: 879), and those social, economic and political factors that make people and their livelihoods sensitive.

The BCCSAP has also been critiqued from a procedural justice perspective. Some have argued that the drafting process was rushed in order to meet international negotiation deadlines and that drafting involved little consultation with affected communities (Alam et al., 2011; Parvin & Johnson, 2015). Similar procedural failures have been identified in terms of implementation, with an institutional set-up that is largely centralised in Dhaka (Parvin & Johnson, 2015). This suggests a structural environment which does little to foster the adaptive capacity of exposed and sensitive communities, which are lacking the avenues and resources to fulfil their rights under these policies.

These barriers is particularly pronounced for women, who face persistent challenges to political engagement and decision-making. In terms of responding to specific gendered vulnerabilities, and addressing underlying causes of vulnerability, the BCCSAP is limited. Gender and women are only explicitly included within the first pillar: Food Security, Social Protection & Health, and within two programs[5]. The BCCSAP is accompanied by the Bangladesh Climate Change Gender Action Plan (ccGAP), developed by the Government of Bangladesh and the International Union for the Conservation of Nature (IUCN). This document sets out plans for integrating “gender equality into climate change related policies, strategies and interventions” (Government of Bangladesh & IUCN, 2013: x). Objectives include greater involvement of women in adaptation programs and disaster management, women’s participation in decision-making, and women’s access and ownership of land and water bodies, women’s mobility, and access to credit and safety nets. The plan is explicit in wanting to create “transformational change” (Government of Bangladesh & IUCN, 2013: x),

[5] T1P8 - Livelihood protection of vulnerable socio-economic groups (including women) & T1P9 - Livelihood protection in ecologically fragile area

which suggest an aim to address underlying causes of vulnerability, consistent with justice-based approaches to adaptation. However, as will be discussed further in Chapter Seven, use of the ccGAP is limited, as the policy sits behind a language barrier – the Gender Strategy drafted for an USAID and FAO project, for example, states "The wide dissemination of the BCCGAP in Bengali to MoEF [Ministry of Environment and Forests] and other stakeholders will also be a key part of Project capacity building" (USAID & FAO, 2014: 8), revealing a lack of procedural justice. As The Asia Foundation (2011: 39) argue, many NGOs have considered the inclusion of women and girls in adaptation initiatives, without consideration of "the underlying issues of gender relations, related power issues". Such issues have yet to receive much attention in the context of climate change responses (The Asia Foundation, 2011), beyond simply engaging women as participants.

More broadly, national and international policy responses to climate change in Bangladesh reflect a 'crisis narrative', with the Southwest at the centre (Lewis, 2011). Key indexes list Bangladesh among the countries most vulnerable to climate change (Maplecroft, 2011). As Parvin and Johnson (2015: 883) write, international and domestic commentators have sought to highlight Bangladesh as poor and disaster prone, promoting a "hazard-centred" approach towards vulnerability. Alongside the crisis narrative, some authors have highlighted processes of 'climatisation' (Grant et al., 2015), whereby environmental phenomena are attributed to climate change for the purpose of political discourse. For example, there is little evidence to suggest that Aila and Sidr are the result of climate change, or were exacerbated by climate change (Grant et al., 2015), despite a body of research that has examined post-cyclone communities in the context of climate change (Mallick & Vogt, 2012). In addition, there has been a tendency among major institutions, including government agencies and NGOs, to 'depoliticise' the environmental changes taking place in the Southwest of Bangladesh, focusing on climate change over the local impacts of historical infrastructure and agricultural interventions linked to global processes (Paprocki, 2015). Brammer (2017) has similarly argued that the issues of population growth and urbanisation are more pressing than that of climate change.

While not seeking to undermine the severity of the climate risks and global injustice, understanding this crisis narrative helps to draw attention towards locally-bound environmental and political issues affecting communities. Environmental changes sit alongside broader political economic and ecological challenges – such as limitations in

governance – which have been less well articulated in the climate change literature. Ahmed, Diffenbaugh and Hertel (2009), for example, argue that climate change is likely to exacerbate poverty, particularly via pressures on food production, with Bangladesh among the most vulnerable. As Dasgupta et al. (2014: 4) argues, "Coastal Bangladesh presages the future for other coastal regions" also at risk of sea level rise and cyclones. Much of the literature concerning the cyclones positions these events as indicative of future events, drawing on evidence regarding the interplay between cyclones, increase sea surface temperatures, and sea level rise, and social vulnerability, to use these events as indications of future events under climate change. Clarity is needed regarding the underlying causes of environmental issues in the Southwest, in order to better develop and implement adaptation efforts. As such, a key aim in this thesis is the consideration of both climate change, and environmental challenges driven by globalisation, as underlying causes of vulnerability, with a view to countering the crisis narrative with an analysis that is ecologically and politically grounded.

Adaptation in Bangladesh

Bangladesh has been at the forefront of research and activity around climate change adaptation, and there are a number of key pathways that have been pursued over the past decade. However, many of these initiatives similarly reflect the hazard and poverty-centric approach found in the BCCSAP (Parvin & Johnson, 2015), while further embedding global political processes that have served to marginalise vulnerable groups (Sovacool & Linnér, 2016).

Firstly, as mentioned, significant amounts of funding going towards physical responses to climate change in the form of infrastructure – embankments for flood mitigation, polders, cyclone shelters and raising of roads – reflecting a hazard-centric approach. Flood management strategies more broadly have tended towards structural solutions, including dams, dikes, and embankments (Poncelet, Gemenne, Martiniello, & Bousetta, 2010) linked to agricultural interventions including the Coastal Embankment Project. This demonstrates a top-down approach to development more broadly (Parvin & Johnson, 2015), with limited consideration of the historical impacts that these large-scale schemes have had on the ecology of the Southwest (Pethick & Orford, 2013; Poncelet et al., 2010). In addition, these

infrastructure initiatives have been linked to land-grabbing, evictions and conflict which has benefitted wealthy landowners and private interests (Sovacool & Linnér, 2016).

Secondly, the government and relevant agencies have pursued the development and implementation of condition-tolerant agriculture, including shrimp farming, and the development and distribution of modified crops, in particular rice, able to deal with hazards such as salinity and drought (Hossain et al., 2015; Rabbani et al., 2013). Processes for the development and distribution of tolerant cultivars, aquaculture and climate resilient cropping feature heavily in the BCCSAP (Government of Bangladesh, 2009). New rain-fed and irrigated varieties of rice and other crops, many developed by the Bangladesh Rice Research Institute (BRRI), have been taken up by both large and small-hold farmers. These strategies can be seen as extensions of the Green and Blue Revolutions. As Davis and Ali (2014) argue, these industrial patterns of agriculture have locked farmers into patterns of dependency on seeds and agricultural chemicals, as well as irrigation, on which many high yielding varieties rely. Given the historical impacts of shrimp farming, the risk of maladaptation is also of concern.

Thirdly, Bangladesh has made significant gains with regards to disaster management, including early warning systems, gathering of data, and building cyclone shelters, particularly via the ongoing Comprehensive Disaster Management Program, with a view to shifting disaster management from reactive response and recovery, towards preparedness and risk reduction (Bangladesh Centre for Advanced Studies, 2010). Disaster-related deaths have declined significantly in Bangladesh over the past 20 years (Alam & Dominey-Howes, 2015), and some efforts have been made to ensure that disaster-preparedness is gender-sensitive – such as constructing shelters with separate bathrooms and areas where women can be separate from men (Government of Bangladesh, 2013).

Fourthly, microcredit has had a significant impact on both the development and adaptation sector in Bangladesh. Microcredit has become an important part of the development and economic climate in Bangladesh. Developed in the 1980s, microcredit now engages nearly two thirds of people in Bangladesh (Paprocki, 2016), through a process whereby economic collateral is replaced with a system of social groups, with a particular focus on women. Kabeer et al. (2011) argue that microcredit has facilitated a significant increase in women's informal employment and economic activity. As a tool for adaptation, a number of projects

have worked to extend microcredit to vulnerable groups, with increased access to economic resources assumed to increase the uptake of adaptation initiatives and technologies (Chowhan & Barman, 2005), and open options for diversification of livelihoods (Jakobsen, 2012). From a feminist perspective, however, microcredit systems have been found to function within established patriarchal structures, capitalising on the power of women's 'shame', women's limited mobility and the elasticity of women's time (Wilson, 2013). In addition, money that women earn is at times handed over to male members of families, effectively undermining the impact of micro finance on women's empowerment (Karim, 2013). In the context of crises or natural disasters, borrowing can manifest as an unsustainable coping strategy, rather than an opportunity for sustained adaptation (Del Ninno, Dorosh, & Smith, 2003). More broadly, microcredit has been seen as a tool for the promotion of neoliberal economics, dispossession and exclusion (Paprocki, 2016; Weber, 2014). Microcredit also aligns with a poverty-focused approach to vulnerability, whereby economic poverty is seen as a key barrier to resilience suffered by people living in exposed areas, which can be amended from a "traditional economic development perspective" (Parvin & Johnson, 2015: 889). As Parvin and Johnson (2015) point out, such approaches overlook the underlying structural issues causing vulnerability and poverty.

Finally, Bangladesh has been the focus of the development of 'Community-Based Adaptation' (CBA). Developed in the early 2000s by organisations including CARE Bangladesh, CBA situates adaptation as a development issue and draws on a tradition of participatory development that advocates for bottom-up, community ownership (Rashid & Khan, 2013). CBA begins with the assumption that vulnerability is not only the result of geography, livelihoods, or dependence on natural resources, but is the result of social, economic, and political dimensions, resulting in differentiated outcomes for different groups (Reid et al., 2009: 12). Such a motivation aligns well with the critiques of hazard-centric and infrastructure-based approaches outlined above. CBA has driven a large number of projects and initiatives across Bangladesh, including the well-known the 'Reducing Vulnerability to Climate Change' (RVCC) project (Pouliotte et al., 2009), which aimed to increase household incomes, food security and capacity building through the diversification of livelihoods (Arnall, Oswald, Davies, Mitchell, & Ciorolo, 2010). Initiatives included the introduction of condition-tolerant crops, homestead gardening, embankment cropping and floating gardens (Habiba et al., 2013b), and capacity building and advocacy with local governments (CARE Bangladesh, 2006). However, important critiques of CBA focus on the assumption that

vulnerabilities, and solutions, are located locally, and that local responses can overcome wider economic, political and ecological issues (Forsyth, 2013). The small-scale, individual nature of many CBA initiatives can be critiqued in terms of Tierney's (2015) concept of the 'neoliberalisation' of resilience, with a focus put on communities being responsible for their own resilience. Community-based approaches can also become romanticised, and can conceal a lack of entitlements and institutional failures, and the limits to individual and community responses. There is also the risk of participatory exclusion, particularly for women, and lack of connections with formal institutions, such as local governments, that would help build sustainability (Karim & Thiel, 2017). In addition, there are questions regarding the capacity of CBA schemes to address significant and unknown future risks, with a tendency to focus on pre-defined notions of environmental change (Forsyth, 2013).

Gender Relations in Bangladesh

As outlined in Chapter Two, the theorised links between gender inequality and environmental vulnerability lie in networks of power, entitlements, roles and responsibilities. As such, an understanding of how gendered inequalities manifest in Bangladesh is needed. Nationally, Bangladesh sits at 119 out of 186 on the Gender Inequality Index, which measures inequality using reproductive health, empowerment in terms of education and representation, and labour market participation (United Nations Development Programme, 2016). Bangladesh also sits at 72 out of 136 on the Global Gender Gap Index managed by the World Economic Forum (World Economic Forum, 2016). These low scores offer an indication as to the persistence of gender inequality with regards to health, income, property rights, democratic rights and human rights. Despite gains with regards to primary education, there remains a significant gender bias in tertiary education (Blunch & Das, 2015), with girls from poorer families more likely to leave school early (Habiba et al., 2013b). In terms of health, food security remains a concern – 24 per cent of women of reproductive age are undernourished (Harris-Fry et al., 2015). In the 2014 Bangladesh Demographic and Health Survey, 13 per cent of women reported that their husband alone made decisions about the use of their earnings (as opposed to women alone, or in discussion with their husbands), and 16 per cent of women report their husbands alone making decisions regarding access to healthcare, visiting family or making purchases (National Institute of Population Research and Training, 2015). Some 87 per cent

of married women have suffered domestic violence (Ministry of Womens and Childrens Affairs, 2011).

Despite this, broad indicators of women's wellbeing in Bangladesh have improved significantly since independence in 1972. There have been improvements in maternal health (Nazneen, Hossain, & Sultan, 2011) and a significant decline in the fertility rate (Nazneen et al., 2011), with 2.18 births per woman in 2013, down from 6.93 in 1972 (The World Bank, 2015). There have been improvements in girls' education, attributed to government policies and a stipend for girls' primary education (Nazneen et al., 2011). In Khulna, girls outnumber boys at school until grade 10, with near universal primary education (Blunch & Das, 2015). Life expectancy for women is 71, up from 46 in 1972. Female labour force participation rates have risen to 36 per cent, from 4 per cent in the 1970s (Kabeer, 2016). In particular, women constitute 80 per cent of the garments industry, as well as being heavily engaged in informal self-employment, in part the result of microcredit (Kabeer, 2016). However, there is an important class disparity in women's employment – the rise in labour force participation mainly consists of women from poorer households, as a result of persistent restrictions on women's mobility. As Kabeer (2016) writes, work force participation is higher among women from poor households and marginalised groups, along with a smaller number of educated women in salaried employment.

Efforts to address women's inequality have included a number of women- and equality-focused policies, and ongoing work by civil society and NGOs. Policies include the 'National Policy for Women's Advancement' and processes for gender responsive budgeting across ten ministries. Equality between men and women is protected in the Bangladeshi constitution – Article 28(2) stated that "Women shall have equal rights with men in all spheres of the State and of public life" while article 19(c) states that "The State shall endeavour to ensure equality of opportunity and participation of women in all spheres of national life". Shahid (2013) argues that the protection of 'state' and 'public' rights largely involves women's participation in the workforce and parliament (Shahid, 2013), leaving gaps with regards to personal and family law. Personal law, which includes property rights, is widely considered to be a matter of religious freedom (Shahid, 2013). Despite the preamble enshrining secularism, article 2a identifies Islam as the state religion, which can have implications for issues such as women's land rights.

A significant gender divide in access to democratic decision making also endures (Chowdhury, 2009). Nationally, Bangladesh is considered to have good levels of women in parliament. The constitution safeguards a quota of 50 seats exclusively for women in parliament, but these women are not democratically elected but rather are appointed by MPs (Jahan, 2014). At the Upazila level, there is a requirement for the elected Chair to be accompanied by an elected Vice Chairman and Vice Chairwoman, who often has limited power. As Nazneen et al. (2011) argue, improvements in terms of women's wellbeing have not been matched by structural and institutional improvements, in terms of political engagement, beyond symbolic and consultative roles. These institutional arrangements are expected to have impacts on the capacity for women and communities to adapt and respond to climate change.

Underpinning much of these issues are strong patriarchal structures, which influence women's roles, responsibilities and capabilities (Neelormi, 2010). Within families, authority and power often sits with a man household head, following a corporate patriarchal structure, which influences inheritance and control of resources. This is further reinforced by practices of *purdah* (seclusion) which limits women's mobility and engagement in roles outside of the home (Kabeer et al., 2011). These structures restrict women's access to material resources, and force women to rely to a large extent on male family members for their wellbeing, creating what has been described as the "patriarchal risk" (Kabeer et al. 2011: 4). This risk and dependency creates what Kabeer (2011: 501) describes as "incentives to comply with, rather than challenge, male dominance", serving to re-create and entrench gender power divisions within households. This concept of the patriarchal risk has been used to argue the particular vulnerability of widows and female-headed households (Feldman, 2001). However, other research from Bangladesh, focusing on food security, has found little difference between male and female-headed households, particularly where women's mobility was less constrained (Mallick & Rafi, 2010).

Gender and the Environment in Bangladesh

Building on the international literature presented in Chapter Two, the following section examines literature from Bangladesh regarding the impacts of environmental change on women. Food constitutes a key site of social-environment relations, and manifestations of

gender relations emerge via gendered divisions of labour (Allen & Sachs, 2007; Hovorka, 2013). Much literature from Bangladesh has documented women's food-related responsibilities, including: collecting water (Sultana, 2007b); collecting firewood; cooking; food processing and preservation (Parveen, 2009); homestead gardening, including vegetables, poultry and livestock (Oakley & Momsen, 2007; Parveen, 2009); and seed saving (Oakley & Momsen, 2007). Men are typically responsible for field-based work and off-farm activities such as marketing (Parveen, 2009), and shopping (Coates et al., 2010). Such divisions are often associated with cultural practice of *purdah* (Ahmed et al., 2012; Levay et al., 2013). However, there has been a significant 'feminisation' in agricultural work in recent decades (Ahmed et al., 2012) – women now constitute 50 per cent of Bangladesh's agriculture workforce (FAO, 2011), occupying a significant role in aquaculture and field labour, particularly among poorer households (Ahmed et al., 2013; Parvin & Ahsan, 2013).

Women also experience a lack of resources and entitlements in agricultural settings. Women constitute only 2.3 per cent of landholders (FAO, 2005). Inheritance customs are biased against women (Quisumbing, 2008) and some research has found links between land ownership and other expressions of poverty (Ahmed, Halim, & Sultana, 2012). Women are often dependent on men for access to land (Quisumbing, 2008), and thus limited in decision-making power and access to other resources (Ahmed T, et al., 2012). For example, women producers who work on land registered in their husbands' names cannot access services and benefits, such as fertiliser or loans (IRIN, 2011). Women agricultural labourers also have significantly lower wages than men, and reduced purchasing power as a result (WFP, 2013). This presages the challenges faced by women in changing agricultural settings.

The relationship between gender and food often also manifests in terms of women's health. Much research has documented women's poorer nutrition (Ahmed, T, et al., 2012), which many authors have attributed to social expectations and discrimination against women (Shannon et al., 2008). Research by Chen et al. (1981) has been significant, arguing that from birth, women and girls are more likely to experience malnutrition, attributed in part to the "inferior status, role, and work opportunities of women in Bangladesh" (Chen et al., 1981: 66). During times of stress and vulnerability, a number of authors have found evidence of women going without food to feed their children (McIntyre et al., 2011; Uraguchi, 2010), compounding health and nutrition problems.

Gendered responsibilities also lead to gendered bodies of knowledge. Much research has highlighted the significant agricultural and food knowledge held by women, arguing for inclusion of women's "critical local knowledge" in adaptation efforts (Alston, 2014: 289). Oakley and Momsen (2005, 2007) found that women in rural areas have extensive knowledge of seed saving, with women's knowledge and preferences playing a significant role in agricultural biodiversity. Other studies have shown that, while women have good knowledge of nutrition, structural barriers including low income and high food costs are a major impediment to household food security (Levay, Mumtaz, Rashid, & Willows, 2013; McIntyre et al., 2011).

Literature from Bangladesh documents a number of key environmental changes that have influenced the lives of women in the Southwest. Over recent decades, large numbers of women have been involved in shrimp farming, with roles including catching shrimp fry, cleaning ponds, and processing at factories and depots (Deb, 1998; Hamid & Alauddin, 1998; Islam, 2008). On the whole, however, the industry has resulted in more variable and decreased demand for labour (Pouliotte et al., 2009). Salinity has had particular impacts on women in the Southwest, by preventing women from practicing homestead production include livestock and poultry farming, fruit tree cultivation (Swapan & Gavin, 2011), and impacting access to clean drinking water. This finding regarding access to water is repeated throughout the literature as the hallmark of women's vulnerability to climate change (Ahmed & Diana, 2015) often prompting the installation of deep tube wells (Bangladesh Climate Change Cell, 2009). Saline drinking water also impacts on women's maternal health, with high rates of pre-eclampsia (Khan et al., 2011a).

Literature from Bangladesh has also begun to document that ways in which women have suffered from environmental degradation, and are likely to suffer from climate change. In applying the feminist theory presented in Chapter Two, women's vulnerability emerges from underlying gendered power relations that pre-exist environmental changes (Egert, 2014; Fisher, 2010). Some literature has considered the unique challenges faced by poor women with regards to slow onset environmental changes. There is evidence that in times of environmental stress, women's workloads increase. The 'elasticity' of women's time (Moser, 1989) emerges as a key coping strategy. Khanom's (2011) study comparing waterlogged and non-waterlogged villages in Southwest Bangladesh, found evidence of women's increased workload in stressed villages, including greater involvement in agriculture, and increasing

time needed to collect and prepare firewood. Dankelman et al. (2008) and Habiba et al. (2013a) found evidence of women's increased workloads in the wake of disasters, and report of girls leaving school to help their mothers as environmental conditions change. Alston, Whittenbury, Haynes and Godden (2014) found evidence of increased incidences of early marriage and dowry for young girls in Bangladesh, with families trying to coping with food insecurity and poverty resulting from climate changes.

The gendered impacts of natural disasters and fast-onset changes have been well documented in Bangladesh. As mentioned, more women than men die during natural disasters (Fisher, 2010; Neumayer & Plumper, 2007). Islam (2012) and A. L. Khan (2012) report that women in coastal Bangladesh are less likely to receive or act on early storm warnings, or avoid travelling to shelters for fear of harassment. During the 1991 cyclone, 90 per cent of people who died were women. Abedin et al. (2013) attribute this in part to the ways in which warnings were transmitted – to men, by men, with information not reaching other family members. Other research found evidence of women and children waiting at home for their husbands to return, to make decisions about whether to evacuate (Abedin et al 2013; WHO, 2002). There is also evidence of gender-based violence in the aftermath of disasters (Fisher, 2010). Swarup et al. (2011), for example, found evidence of sexual abuse in storm shelters in Bangladesh, with many families considering shelters unsafe places to go.

Applying the Theoretical Framework to Bagerhat

As demonstrated through the background information and literature presented in this chapter, Bagerhat provides a stimulating context in which to explore the ways in which gender and broader power relations shape climate change vulnerability and adaptation. The political ecology of Bagerhat sits within a broader institutional and historical setting. Bangladesh continues to struggle with poverty, gender inequality, and a corrupt and highly centralized government system, while also dealing with the enduring legacies of colonisation and conflict.

Bangladesh's vulnerability to climate change is in part the result of geography and population, but also the result of this social and political setting. As such, an examination of the underlying causes of vulnerability, with a focus on the interactions between exposure,

sensitivity and adaptive capacity (Preston & Stafford-Smith, 2009) is needed to inform adaptation. In Bagerhat, the pressing impacts of climate change need to be considered in relation to environmental changes that have occurred as a result of local and global political forces. Along with preliminary evidence of climate change, Bagerhat is dealing with the impacts of widespread salinity, the causes of which demonstrate the impacts of modernisation, neoliberalism and productivist ideology in the region. The hydrology of the Southwest had been significantly affected by the Farakka Barrage, shrimp farming and coastal infrastructure designed to open up agricultural land for export-driven agriculture. Research question one, examined in the following chapter, interrogates these factors in further detail, investigating people's reports of environmental change, and the social and political roots.

Persistent crisis narratives (Lewis, 2011), climatisation (Grant et al., 2015), and the depolitisisation of climate change (Paprocki, 2015), however, conceal these locally bound political ecologies from view. As a result, climate change governance in Bangladesh has not incorporated the insights from political ecologists and environmental historians. Climate change policy, driven by the Bangladesh Climate Change Strategy and Action Plan, appears technocratic and hazard-driven in nature, with the majority of funding clustered around infrastructure responses (Parvin & Johnson, 2015). Gendered vulnerabilities, while recognised, are dealt with in terms of participation of women, rather than considering the underlying causes of gender inequality. These themes are considered in Chapters Six and Seven.

Despite these criticisms, Bangladesh has a strong history of adaptation innovation, with a number of key initiatives documented in the literature – infrastructure responses, adaptive agriculture, microcredit, disaster management and community-based adaptation. However, early research suggests that some initiatives have served to re-embed inequalities and marginalisation through their reproduction of global political and economic structures (Sovacool & Linnér, 2016). As Carr (2008a) argues, adaptation is a political process, with initiatives and outcomes embedded in local contexts, patterns and pathways. Research question three, considered in Chapter Seven, critiques the policies and practices behind adaptation in Southwest Bangladesh.

Finally, literature regarding gender inequality in Bangladesh outlines the great strides that Bangladesh has made with regards to health and education, alongside persistent evidence to political, social and economic marginalisation of women. In rural areas, gender relations around food, agriculture, caring and livelihoods reveal the ways in which women's entitlements and capabilities are curtailed through everyday activities. As an emerging body of literature documents, gender inequality translate into greater vulnerability in the context of environmental degradation. Research from Bangladesh had outlined the specific ways in which women face increased risks in the face of both slow and fast-onset environmental challenges. Research question two, which asks how social, political and economic inequalities shape the experiences of environmental change in Southwest Bangladesh, builds further on these existing findings.

This chapter has detailed the social and political background of Bangladesh, in order to contextualise the present study and justify the selection of Bagerhat district as a case study. The following Chapter Five draws on the contextual information presented here to provide a detailed discussion of the causes and outcomes environmental conditions being experienced by people in the case study villages.

Chapter Five: Environmental Change in Southwest Bangladesh

Introduction

This chapter explores the political ecology of the four case study villages, examining the underlying causes and outcomes of environmental exposure and sensitivity. As outlined in Chapter Two, exposure refers to the likelihood of a system "physically being in harm's way" (Ahsan & Warner, 2014: 33), while sensitivity describes the likelihood of a system being affected by a hazard or shock (Adger, 2006), as the result of the interactions between livelihoods and natural resources. Those communities that rely heavily on natural resources are often more likely to be sensitive to environmental changes than those with diversified livelihoods (Adger, 2006), while roles and responsibilities, such as gendered differentiations in labour, can lead to differentiated exposure and sensitivity within communities. I respond here to Brisley, Welstead, Hindle and Paavola (2012: 14), who argue that adaptation approaches need to "understand the nature and incidence of key climate change impacts, the sources and incidence of vulnerability in the community" in order to adapt in appropriate and just ways. Drawing on the contextual details outlined in Chapter Four, this chapter examines the following questions,

> *What environmental changes are taking place in Southwest Bangladesh, and what are the underlying causes? In what ways are communities exposed and sensitive to these environmental changes?*

The chapter begins with an overview of the key environmental changes being experienced by people in each of the case study villages, including salinity, access to drinking water and changes in the viability of shrimp farming and crop agriculture. These changes are considered with regards to water and food security. The chapter then contextualises these changes in broader political ecologies, considering the impacts of the Green Revolution, the Blue Revolution, and on a global level, climate change. The gendered nature of these changes is considered throughout the chapter, including the ways in which gendered divisions render men and women sensitive in different ways. This chapter links data from interviews,

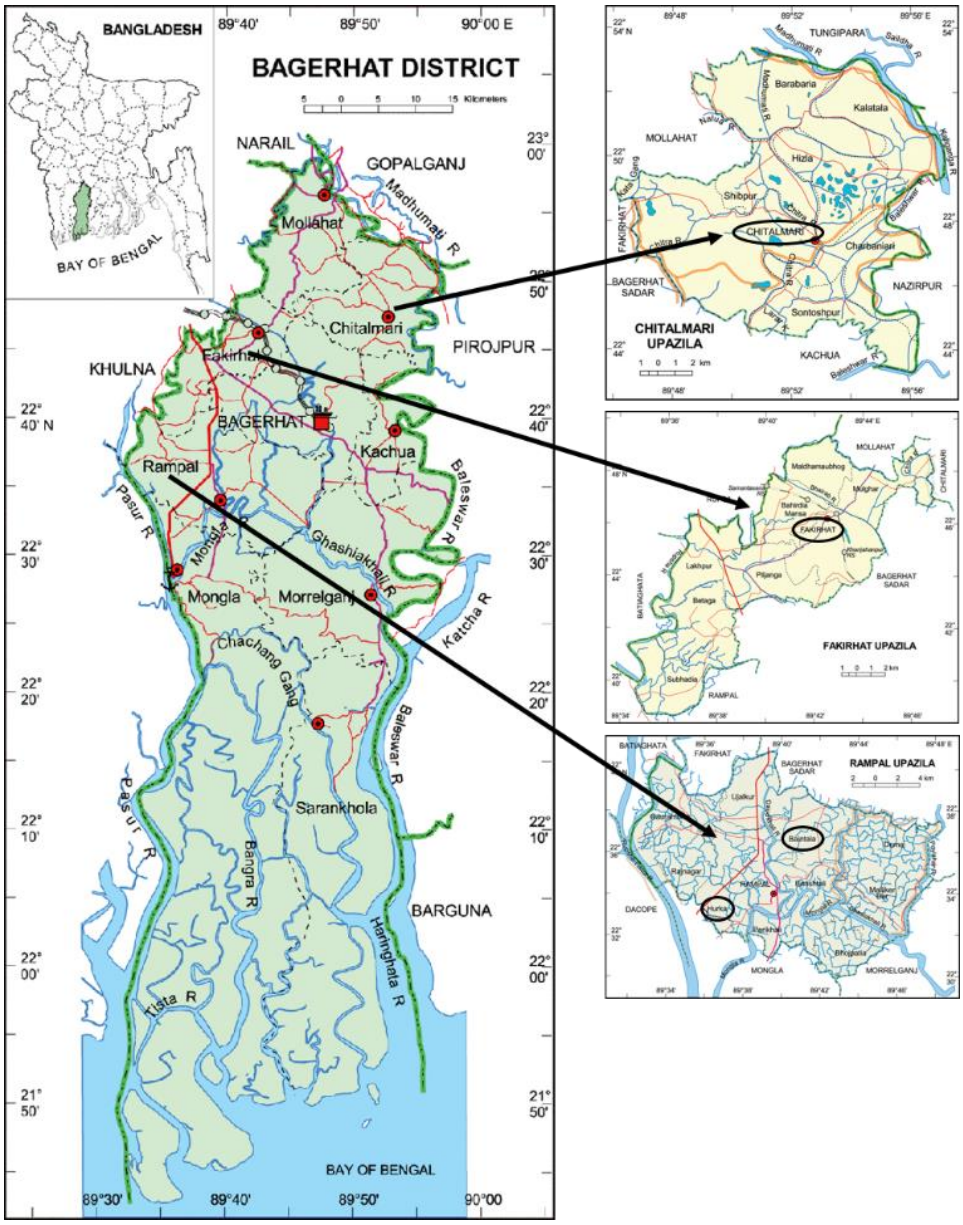
observations and focus groups, with literature, documentation and policy regarding environmental and climate change in Bagerhat, the Southwest, and Bangladesh more broadly. Consistent with a commitment to procedural justice, and the valuing of local knowledge, the reports, observations and recollections of community members are given precedence when discussing on-the-ground environmental conditions, supported with government and scientific data.

I argue here that the vulnerabilities faced by communities in Southwest Bangladesh are a confluence of anthropogenic climate change, neoliberal strategies designed to draw farmers into globalised markets driven by local and global governance, and the impacts of geopolitical relations with India. Climate change is situated in a network of localised environmental changes, challenging the 'crisis narrative' and 'de-conextualisation' of environmental changes seen in Bangladesh. These insights need to guide and instruct efforts towards socially just adaptation.

Environmental and Climate Changes across the Field Sites

In drawing here on an adaptive capacity vulnerbaility framework, I begin with an exploration of environmental exposure, disucssing the environmental change reported by people in each of the case study villages, Fakirhat, Baintola, Hurka and Chitolmari (see Figure 5.1 below), the effects on local agricultural economies, drawing on insights from feminist political ecology to explore underlying causes. Preston and Stafford-Smith (2009) have written about exposure in relation to climate variability, however, consideration of the underlying causes of environmental changes, both environmental and social, is often missing from much adaptive capacity vulnerability analysis.

Figure 5.1: Map of Bagerhat and Case Study Upazilas



Source: Adapted by author from Local Government Engineering Department (2017b)

Findings in Table 5.1 below outline the key changes reported in the villages, compiled from focus groups, hazard ranking, interviews, and discussions with institutional representatives. A number of environmental changes were common across the sites that can be broadly attributed to climate change, including reductions in rainfall, increased temperatures, the loss of six seasons and the impact of cyclones. Besides these changes were a number of locally specific environmental changes, many of which are attributable to political interventions in natural systems and agricultural ecologies.

Table 5.1: Environmental Changes in the Field Sites

	Baintola	Chitolmari	Fakirhat	Hurka
Locally Specific Changes	• Salinity (declining) • Aquaculture virus • Waterlogging • Some salt in drinking water	• Waterlogging • Iron and arsenic in drinking water	• Salinity (declining) • Aquaculture virus • Some salt in drinking water • Seasonal food instability • Water hyacinth	• High salinity • Waterlogging and lack of drainage • Salt in drinking water • Aquaculture virus
Common Changes	▪ Reductions in rainfall ▪ Increased temperatures ▪ Loss of six seasons ▪ Affected by cyclones ▪ Impact of The Green Revolution ▪ Impact of The Blue Revolution			

Source: Compiled by author from interviews and focus groups

Baintola

Baintola village, in Rampal Upazila, was around 20 kilometres from Khulna, and was clustered around a small market intersection, selling hardware and snacks. The central road was lined with houses on one side, and *ghers* (aquaculture ponds) on the other (see Image 5.1). The village had distinct Hindu and Muslim sections, with the Muslim section in a low-lying area, adjacent to a *beel* (marshland). The village was home to a small primary school. Most houses consisted of wooden and tin structures on raised plinths, along with a number of larger concrete homes. The village also had a number of deep tube wells. The village area was thickly covered with trees, with some families owning stands of fruit trees and bananas. Most families were pursuing small-scale rice farming, aquaculture, including fish and shrimp, some small-scale vegetable farming, livestock and broiler chicken production, and some off-farm work, including on-selling food at nearby markets. Many people were engaged in labouring work on other farms. Among those interviewed, land ownership consisted of smallholdings, with some families renting farm land, and some owning larger plots of land outside the village.

Image 5.1: View of a Chicken Shed in Baintola Village

Source: Author

In focus groups and interviews, people discussed the challenges they were having in maintaining agricultural and aquacultural production, with a focus on fluctuations in salinity, waterlogging, as well as changes in rainfall and increases in temperature. Both men and women stressed the lack of access to employment and off-farm work. Access to drinking

water also emerged as a key issue, along with illness and food insecurity for farm animals. The most significant environmental change taking place in Baintola was the decline in salinity over the past 10 years, and the impacts had been both positive and negative for the community. This decline contradicts the trend in the wider Southwest region, and discussions about salinity decline are absent from the scientific, development and sociological literature on the region. The village had also been affected by Cyclones Aila and Sidr, with destruction of homes, trees and animals.

As many participants reported, 10 years prior, the village had been significantly affected by salinity, in the ground water, soil and ponds. At that time, the village had canal access to a large local river, which brought salt water flows to the village. Tesnim [Baintola, 3], an older woman whose family were involved with shrimp and rice farming, described the period, saying,

> *At that time, the saline water used to come. It used to come through the river….When shrimp cultivation started, the salinity increased and the trees started to die.*

Consistent with broader patterns in Bagerhat, participants reported that shrimp farming had begun in the area 30 years ago, and over time, salinity had increased. This causal link – shrimp farming leading to salinity – is often mentioned in the literature, but has been disputed by some, arguing that shrimp farming is likely to thrive in areas already experiencing salinity [Dhaka, 26]. However, shrimp farming is likely to lead to enduring salinity (Swapan & Gavin, 2011).

Participants discussed the contradictions of this time. Shrimp cultivating brought good income, but other crops, trees and growing livestock became unviable. Nawrin [Baintola, 11] described salinity peaking in the dry season, and Omor [Baintola, 13] described patterns of seasonal migration associated with a lack of year-round agriculture. In addition, a number of farmers had been exploited by a wealthy land owner, who had acquired large sections of land for a large, amalgamated shrimp farm. This aligns with the dispossession and transformation of agrarian landscapes in the Southwest with the expansion of the shrimp industry documented by Paprocki and Cons (2014) and others (Shameem, Momtaz, & Rauscher, 2014).

However, salinity had begun to decline around 10 years ago, and *mishti pani* (sweet/fresh water) had returned to the canals and groundwater. Many attributed this to the siltation in nearby canals and river, which was blocking the inflow of saline water, but also blocking drainage. As Tesnim [Baintola, 3] described,

> *Salinity used to come from the river, but there are no channels or canals any more. So the salinity can't come. The fresh water can't even come. Rivers and canals have died from siltation....In the rainy season, the water fills up in the village and we are stuck. Water can't flow through.*

Siltation was attributed to the natural silt flows, and river capture due to shrimp farming. The main local canal has become blocked with make-shift fish-catching dams, which meant that only a small amount of water could pass through the canal (see Image 5.2). Priya [Baintola, 14], who helped with work for a local NGO, argued that these dams had been installed by elites in the area, and the local authorities were unwilling to remove them. With the river and canal blocked, saline tidal flows were no longer able to reach the village, and the high salinity that had built up over two decades of intensive shrimp farming has been washed out over successive rainy seasons.

Image 5.2: Blocked Canal in Baintola Village

Source: Author

The decline in salinity had complex outcomes for the community. Kalila [Baintola, 10], whose family was landless and relied on on-selling fish at the markets, described the impact of salinity as being "*50/50*" – while salinity had hampered the production of vegetables, the

shrimp production had been good. Indicative of a high level of sensitivity, the village has gone through a period of significant economic struggle during the transition away from saline-based agriculture, and this transition had coincided with increases in the price of rice. As Priya [Baintola, 14] described,

> *If we go five years back, the conditions were worse, there was no production of seasonal rice, the price of rice was very high, and people were hungry….After the shrimp cultivation stopped, people faced a great challenge – finding a new source of income was challenging.*

Many people reported that the decline in salinity allowed them to grow rice and vegetables again. Priya [Baintola, 14] and Tanmoy [Baintola, 8], a local teacher, discussed the increase in the use of hybrid seeds as salinity began to decline, with government officials producing training, seeds and fertilisers. Many families had shifted away from using *deshi dhan* (local varieties of rice) to using salt tolerant hybrid seeds developed by the Bangladesh Rice Research Institute, commonly referred to as *birri* or *hybrid* seeds. Priya [Baintola, 14] described the introduction of *birri* rice as having *"changed people's fate".* Others also discussed the challenges of being able to afford good-quality seeds.

Some people still reported ongoing challenges in agriculture, and changes in livelihoods, suggesting their ongoing sensitivity to fluctuating salinity. The underground aquifers remained affected by some level of salinity, and salinity levels still spiked in the dry season. The blocked canals that had allowed for a decline in salinity had led to waterlogging. As Nilima [Baintola FGD 2] described,

> *Because of the decline in salinity, shrimp cultivation is hard. Because of the waterlogging, the land has become swampy, and has become a toxic place.*

As discussed in more detail in Chapter Seven, the people here had responded to the challenges with a number of adaptation initiatives, including livestock, poultry farming, and handicrafts.

Hurka

Hurka village, in Hurka Union, Rampal Upazila, was the most southern village. Hurka consisted of a paved, elevated road, along which sat houses, surrounded by an extensive network of brackish water ponds (see Image 5.3). The view was stark and the air smelled salty. At one end sat an intersection with a main road, leading to an electricity booster station, and primary school-cum-cyclone shelter, and then homes along the central road for about two kilometres, before the boundary with another village. During the follow-up visit in early 2016, a large road leading out to the proposed Rampal power plant had been constructed, which had subsumed many houses and ghers.

Image 5.3: View across the Ghers from Hurka Village

Source: Author

The majority of families we spoke with were involved with aquaculture, in particular, shrimp and crab. Some people were also involved with day labour, including 'mud cutting', building embankments and roads. Among those interviewed, land ownership consisted of smallholdings, with some families renting farm land, and some families owning larger plots of land outside of the village. There were also a number of landless families.

The main challenges the community discussed included economic challenges, with limited work opportunities available for women. Aquaculture virus was considered a major issue. With extensive salinity, people also stressed the lack of agricultural production, with implications for people's, and animal's food security. Both men and women stressed the

negative impact of poor roads. Men also considered drug addiction in the area to be a significant issue.

The wider Rampal Upazila had seen a significant increase in shrimp farming in the 1970s, with large sections of farmland converted to ghers (Karim & Islam, 1999). However, the past 10 years had seen a shift in the village from predominantly shrimp farming, to crab, which were considered hardier, more salt tolerant and resistant to disease (see Image 5.4). As Disha [Hurka FGD 3] described,

> *Because of the salinity, the crab production is good. The shrimp die but crab can survive in the saline water. That's why people prefer crab over shrimp.*

While some had made this shift with the support of a local NGO, others had watched their neighbours and made the shift themselves, driven by the high price received for crabs, and the hardiness of crabs compared to shrimp. The crabs were an export cash-crop, and also considered taboo in Muslim religion, thus contributing little to local food security; however, some families reported eating those crabs not of high enough quality to sell.

Image 5.4: Farmer with Crab in Hurka Village

Source: Author

While cyclone impact was common across each of the villages, Aila and Sidr had both caused significant tidal flooding in Hurka, causing long-standing salinity. Saranya [Hurka, 5], whose

family was landless and relied on day labour and homestead gardening, described Cyclone Aila, saying,

> *The water flooded all the area. There was the sound of water. It was roaring. My son was on the road. We were in our house, closing the door. My son was crying and saying, "Mother come and save me, I am dying." I saw that the water was coming, roaring. After that, we left the village and went to my father's house.*

Orchona [Hurka, 2], who had worked for the local government as a women's representative, described salty water flooding the village for a month. Nihar [Hurka, 7] reported that flooding during Aila and Sidr washed crabs out of the ponds, resulting in significant economic loss, while Saranya [Hurka, 5] reported that salinity had increased after the cyclones, saying,

> *When the Aila and Sidr hit the area, the salinity increased. The saline was toxic… It has reduced a little bit since, because of the rain water.*

The storm surges associated with Aila and Sidr have been widely identified as a key cause of enduring salinity in parts of the Southwest (Rabbani et al., 2013; Warner & Afifi, 2013) and discussion regarding climate change links sea level rise with the increased risk of storm surges (Karim & Mimura, 2008).

Salinity was also linked to human interventions and shrimp-farming, which were causing river siltation, waterlogging, and preventing drainage. As Jaina [Hurka, 12] described,

> *Water stagnation, building embankments, and the decreasing depth of the canals are among the many reasons for salinity.*

Tuhin [Hurka, 3], who had worked for the local government, also discussed the proximity of the village to the sea, and thus their increased exposure, saying,

> *This area is blocked, that's why there is too much saline in the soil. And I want to add, our land is in the southern region of the country, near the sea, so when there is water pressure, we face severe salinity.*

Indicative of the community's sensitivity to these changes, the increase in salinity had been accompanied by a significant shift in agricultural patterns. While rice farming had already

declined significantly in Hurka prior to Aila, the increase in salinity hastened this transition. Tuhin [Hurka, 3] described these shifts in the local political ecology, saying,

> *The salinity was here before the area became waterlogged, and we could still easily grow rice. The changes have taken place suddenly. Now there are fish, but no rice. We can do nothing other than adapt, because whatever the situation is, we need to live, send our children to school. Once upon a time people hated selling fish. But now, as there is no production of rice, people have taken up fish farming as their livelihood and they are selling fish in the market… In this area, rice will not grow again, because of the salinity.*

Nihar [Hurka, 7], whose family were involved with aquaculture, reported that just 10 years ago they had been able to grow rice at their gher, but that now, very few people were able to grow their own rice. Sajjat [Hurka, 11] and others reported difficulty in growing vegetables and fruit trees. As a result, most participants in Hurka relied on nearby markets for their rice, and although prices were reasonable, people felt that growing their own rice would be better for their livelihoods, diet and overall wellbeing. This was a common sentiment across all the field sites.

Many women stressed the impact of salinity on access to drinking water. Many of the surrounding villages relied on a nearby freshwater pond, and historically so had people in Hurka. Hurka village was one of the few villages in the Union area with access to sweet water via tube wells, including a well in the school grounds. As Jaina [Hurka, 12] described,

> *It [salinity] is a big problem. We don't have drinking water, water for washing cloth and cooking…. there is a tube well, far from here, in the school ground. I fetch water from there.*

The extreme localisation and seasonality of salinity was demonstrated by Tuhin, who had leased a plot of land just 3 kilometres away from the village that was free of salinity. As Tuhin [Hurka, 3], described,

> *It's a challenge. We have taken it as a challenge. It is difficult to adapt with salinity. It's too tough as it is natural. In the month of Chaitra*[6]*, the severity of salinity increases….Only in the rainy season the salinity dies because of rain but only for three months…Last year I cultivated some rice as an experiment, because rice doesn't grow well in our country. I grew rice long ago, but last year, in the rainy season, I made a rice farm… The land is three kilometres from here…. It's definitely not sufficient…so I will have to buy more rice for our family.*

With a view to addressing salinity, the village was involved in local level advocacy for the repair of an embankment that had been destroyed during Aila. The community were working with an NGO, and had written to the local government. As mentioned in Chapter Four, and discussed further in Chapter Seven, embankments occupy a contradictory space in terms of socially just adaptation.

Hurka village was also close to the coal-fired Rampal power plant being developed by the Indian and Bangladeshi governments. The project has received much opposition from environmental groups, particularly regarding the impact on the World Heritage Listed Sundarbans Mangrove Forest. In Hurka, land had been subsumed for the construction of an access road to the plant, leaving affected families without arable land and insufficient remuneration. For a community already experiencing a degree of food insecurity and environmental exposure, the construction of the road was adding further to their vulnerability. As Orchona [Hurka, 2] explained,

> *Yes, an electricity plant is being built. I've heard about it, but I've never visited. Many of my neighbours have lost their land. Not the full household area, but the houses that are adjacent to the road are on the verge of being grabbed by the project.*

Durul and Kalpana [Hurka, 9] had lost land to the road (see Image 5.5), and discussed the intimidation and corruption involved in the process, saying,

> *We had land but this road passing through here, it will take our land away. We are worried that they will take our living land too…. the amount [paid] is less than the price of the land…. If we had sold this land, the price may be one million taka and the*

[6] In the Bengali calendar, Chaitra is the last month, beginning in mid-March.

government paid us the half amount of the real price…. We don't know whether we can stay in this place or not!...they just grabbed the land….We had good times before….our property is gone because of that road. Now the new road is taking away the rest of land…

Image 5.5: Photos Taken at Durul and Kalpana's Homestead in February 2015 (left) and February 2016 (right), Following Construction of the Road to the Rampal Power Plant

Source: Author

This was echoed by Nihar [Hurka, 7] who had also lost five metres of land to the road. He reported mismanagement and confusion, with no consultation, the road position changing, and government officials demanding a portion of the land costs for themselves. While Nihar was happy with the amount he had sold the land for, he was yet to receive this money.

Fakirhat

Fakirhat village was clustered around an elevated paved road, about two kilometres from the closest major market and school. On one side of the road were integrated shrimp and rice plots, and the other side were the homes, backed by a small canal. The village was home to a large Hindu ashram, where community members meet, and the community was mostly Hindu. The shrimp and rice plots were accessed via a network of canals, and wooden boats sat close to the road. The homes were predominantly tin buildings on raised plinths, with some large two story concrete homes. The village was frequented by salesmen with carts and on foot, selling clothes, snacks and incense. A funeral pyre sat next to the road. The village

was a few kilometres from a major aquaculture market, where fish and shrimp were being sold to domestic and international markets.

Despite a decline in salinity in the past 10 years, similar to that in Baintola, shrimp remained the primary income for many of the families in the village, with integrated rice and shrimp farms (see Image 5.6). Rice production had increased over the past decade, in part due to the use of hybrid seeds [Fakirhat FGD 3]. Some families were also engaged in day labour and dairy. Among those interviewed, land ownership consisted of small hold, with some families renting farm land, and some people engaged in *bondok*[7] sale of their land.

Image 5.6: Integrated Rice Farm and Gher in Fakirhat Village

Source: Author

The main challenges facing the community included a scarcity of drinking water, aquaculture diseases, flooding, siltation of canals, waterlogging, temperature fluctuations, and variations in rainfall. The area was also affected significantly by flooding from Cyclone Sidr. Two families in Fakirhat were still paying back loans they had taken out in 2009 to re-stock their

[7] Land mortgage system whereby a tenant pays the farmer for the land, and is able to farm the land until such time as the landowner can repay.

ponds after Cyclone Aila. Both men and women discussed the declining prices of fish and shrimp, the high cost of fish food, and aquaculture virus. Men and women also discussed a lack of nutrition, with men discussing the poor nutritional quality of food, and women discussing the difficulties of having to rely on markets for their rice for six months of the year, suggesting a degree of seasonal hunger; there were particular pressures on women, who were expected to eat last at family meals. Women also stressed the impacts of drug addiction among young men. Both men and women stressed the impact of unemployment.

As with Baintola, people reported a decline in salinity over the past decade, contradicting a broader upward trend in the area (Fakirhat DMC, 2014). This decline was confirmed by a local government official, who reported that cropping intensity has increased with the decline in salinity in the area [Fakirhat, 15]. The initial rise in salinity was attributed to a canal project that had been implemented by the government in the 1980s. The 'Flood Action Plan' was initiated by Prime Minister Ershad in the wake of large floods in 1988, involving a top-down, technocratic focused approach to flood mitigation. The Plan saw the construction of tall embankments alongside Bangladesh's main rivers, along with sluice gates and drainage canals, overlooking existing evidence regarding the dangers of embankments for agriculture and river health (Lewis, 2011). As Jamini [Fakirhat, 6] described,

> *When Hossain Mohammad Ershad was in power, he joined the river Teesta and Poshur with a canal. That canal is called the 'Plan' River…. Before this river, there was no salinity but after the river was dug, salinity entered the village. But after the canal dried up, salinity has disappeared, because the water has no way to enter the area.*

The Plan canal had since been blocked by siltation and embankments, and salinity in the area had declined. Dipen [Fakirhat, 9] described the decline in salinity as being "*all man-made*", with natural salty tidal flows inhibited by embankments, siltation and other human activity, and declining river depths were corroborated by the Fakirhat Upazila Disaster Management Plan (Fakirhat DMC, 2014). The same mechanisms causing the decline in salinity were also causing waterlogging [Fakirhat FGD 3], which is corroborated by the local government (Fakirhat DMC, 2014).

Declining salinity had significantly affected the aquacultural industry in Fakirhat, indicative of the community's sensitivity to environmental change. Shrimp farming had begun in the

area around 50 years prior, and remained the dominant industry. For many, the shift to shrimp had been the result of economic imperative and many reported good incomes when shrimp prices and production were steady. Saltwater *bagda* shrimp (see Image 5.7) continued to attract higher prices at the markets, as compared to freshwater *golda*. Women in Fakirhat linked improvements in girls' education to the income gained from shrimp farming [Fakirhat FGD 2]. The decline in salinity in the area had had a negative impact on *bagda* production. As Bijola [Fakirhat, 13] described, shrimp has been a prime source of income, with impacts to incomes and loan repayments as production struggled, indicating the sensitivity to aquacultural livelihoods. However, while the *bagda* production had suffered, families were able to revive the production of rice and other crops as salinity declined. As Jamini [Fakirhat, 6] said,

> *It is good for us…The rice production will increase and overall, all the crops and vegetables will grow well. Due to the decrease of salinity, most of the trees are green now.*

Image 5.7: Farmer with Bagda in Fakirhat Village

Source: Author

Many farmers were now growing a combination of freshwater *golda*, salt water *bagda*, and a range of fish, as well as rice, in the same brackish pond. As Bibha [Fakirhat, 7] described, while the bagda production was not going well, production of white fish and subsistence food had improved, and they felt better – they were able to grow for themselves, grow fodder for

cattle, and sell fish at the markets. While some felt that their economic position had declined with the contraction in bagda farming, Bibha felt that the return to rice had helped them economically. Munazza and her husband Jitu [Fakirhat, 2] described the decline in salinity as being both positive and negative.

Others felt it difficult to diversify beyond shrimp. People acknowledged that much fallow land and land for vegetable farming had been lost to aquaculture ponds. Vegetable farming in the area was only for subsistence, and the broader region did not support large-scale vegetable agriculture [Fakirhat FGD 3]. Nilima [Fakirhat, 3] and her family felt that shrimp farming wasn't such a good idea, with production waning over the past decade, but they felt they were embedded and had few alternatives. They were maintaining shrimp farming with rolling microcredit loans (discussed further in Chapter Seven). The local industry was also significantly affected by a shrimp virus, which community members ranked as a significant concern. In response to the declining salinity, one farmer, Jitu [Fakirhat, 2] reported adding salt to his pond for the last two years – 150 kilograms of salt for one pond, bought at a nearby salt factory. However, one local government official argued that this was not a practice that the agricultural department would encourage, despite knowing that that practice was occurring, and understanding the challenges facing farmers in areas where salinity was declining [Fakirhat, 15]. In a focus group, men said that while some people were adding salt to their ponds, it was poor practice [Fakirhat FGD 3].

The decline revealed the political ecology, and the gendered impacts, of salinity. While men linked salinity to aquacultural production, women discussed the scarcity of fresh drinking water, and the impacts on vegetable farming. Some salinity remained – people reported spikes in salinity in March and April, declining with the monsoon, and drinking water still tasted salty, although villagers argued that it was *mishti* (sweet). The decrease in salinity had resulted in blooms of water hyacinth, a fresh water weed, which was blocking tidal flows, polluting water and leading to an increase in mosquitos (see Image 5.8).

Image 5.8: Waterway Affected by Water Hyacinth in Fakirhat Village

Source: Author

People reported economic challenges around the high cost inputs and low prices received by farmers, reflective of difficulties in the broader aquaculture political economy. Dipen [Fakirhat, 9] discussed the high cost of hatchery fry (baby shrimp that are fattened in ghers), and men discussed the high price and low quality of fish food, leading to slower growth rates and diminished income. People reported the low incomes from aquacultural products as a *boro shomosha* (big problem) [Fakirhat FGD 3]. People reported difficulty in dealing with middle men purchasing their goods, with delays in payment, and shipment problems that villages felt were fictitious [Fakirhat, 1]. There was a broad sense that while they suffered, middle men continued to received good prices on the international market.

Chitolmari

Chitolmari village, although only 25 kilometres from Fakirhat, had significantly different conditions to the other case villages. The village consisted of a strip of homes surrounded by flat fields, with a low land area around 1 km away, where ghers and rice farms are situated. The wide, dry, open fields were propagated with wheat, dhal, sesame and sunflowers (see Image 5.9). Most families were engaged in smallholder farming, including rice, aquaculture,

and cash crops, including wheat, dhal, jute and sunflowers. Some families had leased their land in a *bondok* mortgage system. Chitolmari was the only village where community members were reported to have migrated away, including women travelling to Dhaka to work in garment factories [Chitolmari FGD 3]. The need to migrate gives an indication as to the higher sensitivity of the village, but the capacity to do so may also be an indication of the adaptive capacity and connectivity among community members. The wider region is classified as economically poorer and less food secure than the other case study areas (WFP & World Bank, 2013).

Image 5.9: Dhal and Sunflower Crops

Source: Author

The homes were all tin structures on raised land, with no concrete homes. The village also enjoyed the absence of salinity, distinct from the broader trend in the Chitolmari Upazila described by a local government official, and NGO staff. After the construction of a Water Development Board (WDB) embankment in the 1990s, tidal flows reduced, and the village had no ongoing issues with ground or soil salinity. As Abhoy [Chitolmari FGD 3] described,

> *When there was salinity here… Maybe 15 years back…. it was difficult for us to cultivate rice here. The roots of the paddy rotted because of salinity.*

The community was now reliant on deep tube wells for their drinking water, which was affected by iron and arsenic. Arsenic is naturally occurring in shallow aquifers in Bangladesh,

and state-sponsored proliferation of groundwater over surface water has led to an arsenic crisis (Sultana, 2006). The lack of electrification in the village meant that community members were not able to use filtration systems that would help clean the water. Underground extraction of water was further hampered by the lack of electricity to run pumps. As Abhoy and Sourav [Chitolmari FGD 3] discussed:

> *Abhoy: We do have a lot of demands. We don't have electricity. They are not giving us electricity lines.*
>
> *Sourav: We need water for irrigation but we have to travel far to get water for irrigation.*
>
> *Abhoy: We need more deep tube wells. We cannot cultivate without water.*
>
> *Sourav: We need these three things, water, road and electricity.*

Key challenges facing the community were a combination of environmental changes, as well as a lack of access to key services and resources, including a lack of access to safe drinking water, water for irrigation and the lack of electricity. Community members also discussed the poor quality of fertilisers, crop seeds and aquaculture fry, the lack of access to farming technology and training, drainage problems and untimely rain and seasons. In terms of agricultural markets, people discussed the poor prices for agricultural goods, and poor roads hampering access to markets.

Some people were taking part in an NGO-led experiment in sunflower farming for oil production. The sunflowers had received significant attention from the government and NGOs, and people reported that when the flowers were blooming, many officials would visit to take photos. The Bangladesh Government delegation to COP21 also mentioned sunflowers as a significant adaptation taking place in the south (Bangladesh Government Delegation, 2015). The sunflowers were initially being grown with the support of a large local NGO – one field staff member described sunflowers as an alternative crop, able to be grown on fallow and saline-affected land [Chitolmari, 5]. Farmers saw sunflowers as a drought-tolerant, dry-season crop, and more productive and profitable than other field crops. Many farmers were growing three crops a year on their land, with a combination of sunflowers, jute, wheat, mustard and dhal, consistent with broader trends towards double or triple cropping patterns

throughout Bangladesh (Masum & Hasan, 2013). While initial interviews revealed that the sunflowers were being grown with no government support, follow-up visits revealed that the government had later donated and erected signs. However, villagers reported that the government seeds were of a poor quality, which could be seen in the contrast in flower size between neighboring fields.

Production of sunflowers was affected by patterns of water availability and use, with a particular sensitivity to changes in rainfall patterns. In 2014 and 2015, sunflower crops had been damages by untimely rain. This was linked to reports from the community about unpredictable rainfall patterns, and the loss of the 6 season pattern, indicating the ongoing impact of a changing climate, and the risk of new crops becoming a 'maladpatation'. The village was also disconnected from water bodies, and was relying on pond water for watering crops. People explained that the village had no access to reliable river water, with the nearby major river suffering from siltation. This was supported by one local government official, who said that without reliable sources of irrigation, the village relied on rain water [Chitolmari, 7]. As such, watering the sunflowers required carrying water from nearby ponds by hand, a task that fell predominantly to women. The work of caring for the sunflowers had specific gender divides, with men having received training to care for the sunflowers, but women doing the majority of the day-to-day work (discussed in Chapter Seven).

Evidence of Climate Change

The above discussion outlines the complexity of environmental challenges facing the case study communities, with local agricultural interventions in particular altering and degrading environments. Men and women in the villages also identified a range of changes that they associated with climate change, in particular, changes in temperature and in rainfall patterns, corroborating many of the climate related impacts discussed in scientific literature regarding Bangladesh (Yu et al., 2012). This was despite very few participants understanding what climate change meant (discussed in Chapter Six).

In focus groups and interviews, people reported changes in rainfall patterns, and no longer being able to rely on timely rains. This was particularly noted in Baintola. As Nipa [Baintola, 17] described,

> *Rainfall is very irregular now. In the past, the rain came in the rainy season, in winter the weather was cool, but now there are no rules in nature.*

In Baintola, Nasima [Baintola, 1] said:

> *This year, the rain has decreased, the monsoon has not come, and we can't collect the rainwater. Last year, the vegetables were better, we got more good food, but this year, the rain has decreased.*

Zorah [Baintola, 16] similarly said,

> *Before there was more rain but now there is less. In the field, we can't grow vegetables, we can't get good production in the ghers, in the field we can't grow rice, and there is a food crisis. It is great problem for us.*

Many people noted that Bangladesh had "*lost its 6 seasons*" [8] [Bekortmari FGD 1], without the clear seasonal variations that farming communities has relied upon. People also reported that temperatures in winter and summer has become more extreme, with increasing temperatures over the past 10 years confirmed by the Khulna Meteorological Office (Fakirhat DMC, 2014).

Hurka, Fakirhat and Baintola villages were all affected by either Cyclone Aila or Sidr or both, indicating a high degree of exposure, although none were in the direct path of the storms. Climate change is expected to affect the frequency and intensity of cyclones, with increased ocean temperatures, and worse effects of associated storm surges as a result of sea level rise (Alam & Dominey-Howes, 2015). There is no evidence to suggest that Aila and Sidr are the result of climate change, or were exacerbated by climate change. However, as Grant et al. (2015) argue, there has been a tendency in some literature to engage in processes of 'climatisation' and decontextualisation, attributing environmental phenomena to climate change for the purpose of political discourse. The following section is based on the premise that while Aila and Sidr may not be manifestations of climate change, the outcomes reveal

[8] Based on the Bengali solar calendar, the year is split into six seasons of three month intervals – *Gismo* (summer) from March to May; *Barsa* (Rainy seasons) from June to August; *Sarat* (Autumn) from September to October; *Hemanto* (Late Autumn) from October to November; *Seet* (Winter) from November to December; and *Basanto* (Spring) from December to February.

ongoing exposure to future hazards, and sensitivity to natural disasters as a result of poverty and reliance on natural resources.

During the cyclones, the villages had experienced a combination of flooding and winds. Tidal surge in Hurka also contributed to enduring salinity in the area. Tidal surge is a key mechanism through which climate change is expected to impact the Southwest, with sea level rise increasing the height of cyclone induced tidal and storm surges. Many people reported loosing trees, animals, and parts of their home or other buildings. In Baintola, Nipa [Baintola, 17] reported,

> *Yes, we were affected. My fruits trees were uprooted, my house was half broken, the gher was also affected and our goats died. Our chickens and ducks also died. During Sidr a lot of fowls died.*

Kailia [Baintola, 10] lost her home during Sidr, and received assistance from a local NGO to rebuild. Nilima [Fakirhat, 3] and Jamini [Fakirhat, 6] talked about the impact that cyclone-related flooding had on their aquaculture – flooding had caused gher walls to break, and shrimp to wash away. Manda [Hurka, 10] reported loosing part of the roof, and chickens in her farm being killed, explaining,

> *In the time of Sidr, I did have a poultry farm but that farm was broken and I lost my farm. Among the 200 chickens, about 160 died and the rest also died gradually… After the loss, I was in debt. My husband became sick. My children were unable to earn. So I needed money. I struggled hard to manage everything.*

Some families were facing ongoing economic ramifications. Nilima [Fakirhat, 3] and Nihar [Hurka, 7] both reported taking microcredit loans to restock their ghers after flooding had causes crab and shrimp to wash away, and the families were yet to repay these loans (microcredit is discussed in more detail in Chapter Seven).

Institutional representatives and government officials at the Upazila and Union level highlighted key projections and broad trends regarding climate change. One departmental official described climate change as increasing *"frequency of calamities"*, increases in temperature and changes in rainfall [Khulna, 4]. Another official noted higher temperatures and stress on the availability of surface water over the course of the year [Khulna, 10].

However, the perceived importance of climate change was mixed – while most had heard about climate change, some were skeptical about projected impacts, or felt that local-level environmental issues, associated with policies and interventions, were more pressing. This was matched with a lack of clarity around the purpose and goals of adaptation – governance responses are discussed in more detail in Chapter Seven.

The Blue Revolution

As discussed above and in Chapter Four, the rapid expansion of shrimp industry – the 'Blue' revolution – has significantly shaped the political ecology and economy of the Southwest. Up until the 1970s, Bagerhat had low agricultural production, due to the extensive spread of *beel* (swampland) (Ito, 2004). Farmers began salt-water shrimp farming in the 1980s, bolstered by good returns on the international market (Ito, 2002) (as Munazza [Fakirhat, 2] described, "*you people eat the shrimp*"). The rise of the industry coincided with an increase in salinity in the region, in part also the result of the Farakka Barrage (Ito, 2002). Each village was engaged in shrimp farming to some degree. In Baintola, Fakirhat and Hurka, where aquaculture was a major part of people's livelihoods, changes in market and environmental conditions were a primary challenge, overlapping with the impacts of climate change in a number of ways.

Shrimp farming had triggered declines in other forms of agriculture. Large sections of land in the Southwest previously used for rice and other crops had been converted to aquaculture, reducing the availability for grazing land and crop-based agriculture. Some linked shrimp farming to waterlogging, with waterways blocked by shrimp farms, as reported in Baintola. For many, shrimp farming was seen to have created and embedded salinity in particular areas, particularly in poldered areas where there was an incentive to allow the in-flow of salty water, aligning with other research findings (Habiba et al. 2013a; Swapan & Gavin 2011). This was the case in Fakirhat, where the 'Plan' project canal had channeled salt water to the village. One academic [Khulna, 5] pointed to areas where communities had turned away from shrimp farming, resulting in declines in salinity, as proof that the industry was to blame. However, others were critical of such claims, with another academic [Dhaka, 26] arguing that shrimp farming had emerged in areas where salinity was already present, and declines were better explained by changes in water availability from the Farraka Barrage. In both

arguments, the shrimp industry has created a political ecology around the utility and desirability of salt, and has provided incentives to maintain salt water ponds. One departmental official felt the industry had made money via foreign currently *"in lieu of local ecology"* [Khulna, 4].

While shrimp had brought significant economic gains for some, others stressed the social and economic inequities that had emerged (Pouliotte et al., 2009). One participant [Hurka DMC] linked shrimp farming to the erosion of cultural practices, saying,

> *The shrimp farming has not only killed our livelihood, it has also destroyed our own culture. In this season, the crop harvesting period, in our locality, there were local stage shows, local song performances, but now there is no sign of those things.*

One academic [Khulna, 5] discussed the environmental and social unsustainability of shrimp. Shrimp farming had damaged the ecology and had offered little employment, which he described as "*not socially feasible*" in highly populated areas such as the Southwest. Shrimp farming does not support *"occupational multiplicity"* in terms of diverse income opportunities [Khulna, 5] as was evident in Hurka, where aquaculture had over time eliminated other agriculture opportunities. He also argued that while rice money stays in the region, money from the shrimp industry goes abroad. A leader from an environmental NGO argued that shrimp farming required much less labour that rice farming, around 2 people per acre required for shrimp, as opposed to 50 people per acre for rice, leading to an employment crisis and the erosion of local culture, customs, and traditions [Khulna, 8].

Farmers in Baintola, Fakirhat and Hurka talked about the challenges they faced in maintaining solvency, given the high cost of inputs, including fry, feed and medicines, alongside the declining prices for aquaculture products at the market. One departmental official stated that while export value in terms of *taka* is increasing, the volume of production was decreasing, particularly for *bagda* [Khulna, 11], which he linked to declines in salinity from river siltation. Shrimp farmers, he argued, were now having to diversity into new forms of aquaculture. Shompa [Fakirhat, 8] argued that only better off families were able to grow shrimp and she felt that their area of Fakirhat was generally better off than others as a result. Her family, however, had not been able to establish themselves in the market.

Baintola had experienced land occupation as a result of the shrimp industry [Baintola, 14]. As one DMC member explained [Hurka DMC],

> *Thirty years ago, we had good production of rice. At that time, a group of people introduced shrimp cultivation and they were benefitting from shrimp farming. But the general people were not getting any benefits. During the time of the military ruler Hussain Muhammad Ershad, there were no small ghers. Powerful individuals illegally took all the ghers with their political or man power and earned millions of taka from the area. We lost everything to those powerful individuals. Over time, we made movements against those powerful people and got our land back and individually, re-made some smaller ghers and earned from there.*

Others discussed the impact of wide-spread shrimp disease, with many farmers unaware of the causes. One departmental official explained that the diseases were the result of too much food, overstocking, algae, decomposition, lack of oxygen, and water turbidity hampering sunlight [Khulna, 9]. Avi in Hurka [Hurka, 4], had been involved with a USAID project designed to reduce shrimp disease, educating farmers about how to regulate oxygen levels in their ponds – for Avi, however, the project had made no difference to disease levels. Some NGOs and the government were working to provide disease free shrimp fry via monitored and tested hatcheries, encouraging regular draining of ponds to kill bacteria, and discouraging farmers from applying cow manure to the base of ponds [Khulna, 9], a practice we observed in Hurka.

Shrimp farming has been conceptualised by some NGOs and government agencies as an adaptation method in salinity-affected areas, with shrimp farming and other forms of aquaculture allowing farmers to farm in areas where traditional crops have become difficult to grow, and gain income in the export market. However, such perspectives overlook the social and environmental ramifications discussed, and the potential interactions between climate-induced salinity and storms, and environmental degradation caused as a result of shrimp farming.

The Green Revolution

Alongside the Blue Revolution, the Green Revolution has resulted in significant changes to the Southwest landscape and hydrology. The Green Revolution began in Bangladesh in the 1980s, and saw significant increases in outputs of rice and other crops (Orr, 2012). As social norm change discussions in the villages revealed, the uptake of new high-yielding varieties (HYV) – referred to by most participants as *hybrid* or *birri* varieties, catchall phrases used to describe new varieties of vegetables and rice developed by the Bangladesh Rice Research Institute (BRRI) – had been keenly pursued, with nearly all people interviewed in the villages involved with some kind of hybrid crop production. As one departmental official noted, agriculture is now largely mechanised, along with the use of hybrid seeds and *"technology farming"* [Khulna, 4], in addition to the widespread use of chemical fertilisers and pesticides, which nearly every rice-growing family reported using. However, these changes were having flow on effects for farmers' livelihoods and food security.

The widespread shift to HYV of rice had impacted on access to fodder for livestock. Prior to the advent of fast-growing varieties of rice, slower growing *deshi* varieties of rice would grow 7 feet tall, leaving 6 feet of straw. Newer, faster growing varieties, however, could be as small as 1.5 feet, leaving only one foot of straw.[9] While rice is now grown across more land, the smaller plant size has limited the availability to fodder for animals.

Community members also had mixed feelings regarding the use of chemical inputs, feeling that this was essential, but also harmful to people and environments. As Tesnim in Baintola [Baintola, 3] described,

> *Well, we have to apply fertilisers…. Nothing grows only with the land.*

People across all the sites were concerned about the quality of food from the markets, given the risk of exposure to chemicals. Women in Baintola [Baintola FGD 1] listed the misuse of chemicals as a key concern, discussing a general lack of knowledge, leading to skin disease, animal disease, and negative impacts on yields due to overuse. In Hurka [Hurka FGD 1], women discussed the impact of chemicals as leading to poor nutrition, while in Chitolmari [Chitolmari FGD 2], men felt concerned about the application of chemicals on food bought at

[9] 7 feet = 2.1 meters; 6 feet = 1.8 meters; 1.5 feet = 45 centimeters; 1 foot = 30 centimeters.

the markets. In Fakirhat [Fakirhat FGD 3], men reported that while the cost of food was reasonable, all commercial food was grown using chemicals, with no access to organic food. While some families said that they tried to avoid buying adulterated food, others argued that exposure to chemicals was inevitable, given that no commercial food is organic, and chemicals are needed for food production. Lazuli [Baintola, 12] said that she was worried about food from the markets, but felt that there was little they could do to overcome this. Those families and communities who were able to produce a good proportion of their *own* food, in particular those families with access to land, were faring better in terms of food security and nutrition than those who relied on buying food from local markets. Reshma [Baintola, 7] had convinced her husband that they start growing their own vegetables, due to concerns about market-bought food. Having heard about issues associated with chemicals on TV, she also felt there was a taste difference. A local doctor in Baintola [Baintola, 6] indicated that there had been significant growth in the number of families growing their own vegetables in the past three years, which they attributed to families wanting to avoid adulterated food – the desire to eat family-grown food was significant.

These industrial patterns of agriculture had also locked farmers into patterns of dependency on seeds inputs and irrigation (Davis & Ali, 2014). As Omor in Baintola [Baintola, 13] discussed, the hybrid varieties of rice required the use of "*bideshi products*" (foreign products) including technologies and pesticides. Tanjua [Fakirhat, 4] explained that all food was affected by chemicals, as these were needed for production. Men in Fakirhat reported that while there were no issues with getting access to seeds, the quality was unstable [Fakirhat FGD 3]. Men in Baintola discussed the high cost of irrigation, with pumping requiring electricity or oil [Baintola FGD 2]. In Chitolmari, where a hybrid variety of sunflower was being grow, men and women felt that these seeds could not be preserved, arguing that there were specific storage conditions for the hybrid seeds that they could not meet – experiments with preserving had failed to produce viable seeds. As Abhoy [Chitolmari FGD 3] described,

> *They preserve seeds with chemicals, in a scientific way and we don't know how to save seeds in that way.*

Among institutional representatives, there were mixed feelings regarding the advent of industrial farming. One departmental official said that his department were concerned with

the transfer of technology to farmers, including the transfer of new varieties of seeds, as well as mechanisation, to replace *"indigenous technology"* which he considered as a positive feature, considering the high cost of labour, particularly during harvesting periods [Khulna, 4]. One government official [Khulna, 1] involved with agriculture, argued that Bangladesh's soils are suffering from nutrient deficiency, due to fertiliser misuse or unbalanced use, over-cropping, limited knowledge among farmers, and the use of HYV. One government official in Fakirhat discussed how extension officers were encouraging farmers to reduce their pesticide and fertiliser use, including encouraging the use of indigenous technologies, arguing that the overuse of chemicals was serving as a barrier to export [Fakirhat, 15]. More broadly, Bangladesh is seeing significant issues with contaminated fresh food, the result of overuse of pesticides, and the use of chemicals such as formalin to keep food fresh (Ali, 2013).

Climate Change as a Magnifying Glass

As discussed above, environmental changes across Bagerhat sit in complex webs of causes and outcomes, with climate change emerging as just one factor among many. As the IPCC has written, "Local, regional, and global environmental issues often combine in ways that jointly affect the sustainable meeting of human needs" (IPCC, 2001). However, much sociological and development research takes broad, almost stereotypical perspectives of the impact of climate change on Bangladesh, without attention to significant geographical variations, and a 'crisis narrative' conceals locally-produced vulnerabilities.

This complexity not only makes governance and adaptation difficult, but has led to a degree of climate change scepticism among some researchers, NGO staff and government officials. Many institutional representatives reflected on the Bengal delta as a place of historical and ongoing environmental change and natural disaster. One NGO leader listed salinity, disasters and siltation as 'natural' events, differentiated from incidence such as oil spills, agricultural chemicals, deforestation, or salinity and siltation associated with embankments [Khulna, 13]. In addition, some institutional representatives considered climate change to be something 'new' [Khulna, 4; Khulna, 9], but which people would intuitively be able to deal with. One departmental official [Khulna, 4] argued that climate change was *"a recent issue"*, something his department was just starting to consider. He felt that the potential existing impacts of climate change on agricultural production were negligible – while there may be long terms

impacts in the future from natural disasters, current production levels were more impacted by farmers' education levels, access to technology and crop types, and advances in technology and crop varieties would smooth out any impacts. A representative from a legal NGO [Khulna, 8] explained that climate change is a burning issue, but wasn't sure about the effects – rather, unplanned development was causing salinity and waterlogging. Some institutional representatives felt that the significant focus on climate change found in Bangladesh currently was something that NGOs and UN agencies were using to attract funding. One academic felt climate change to be commercial, politicised and profitable [Khulna, 5] and discussed a profound lack of understanding of the nature of the Bengal delta, from the colonial period to today [Khulna, 5]. He argued that in five to ten years, the term climate change will have lost its meaning, and funding for climate change projects would start to decline [Khulna, 5].

As a way of conceptualising the interactions between climate change and local environmental changes, one NGO staff member described climate change as a *"magnifying glass"* [Khulna, 22], amplifying existing environmental challenges. This analogy is useful in understanding how climate change and local environmental factors are linked, with climate change having the future capacity to worsen conditions created by policy and interventions. Many institutional representatives argued that climate change could not be understood or addressed without considering the impacts of agricultural policy and government and NGO interventions, including shrimp farming, poldering and embankments, sedimentation, unplanned infrastructure, and the Farakka Barrage. For participants in the villages, many of the environmental changes they were experiencing – salinity, waterlogging, river and canal siltation, low river flow – were seen as a combination of natural phenomena, and human-made factors. These interactions are now discussed in more detail.

Salinity

Salinity is embedded in the discourse on climate change in Bangladesh. There is a widespread perception that the salinity seen in Bangladesh currently is the result of sea level rise, as well as tidal surges, as seen in Hurka. Climate change researcher Dr Atikur Rahman has said that "In Bangladesh, climate change has a taste. It is the taste of salt" (cited in Chandra, 2010: 8). However, many institutional representatives were insistent that to understand the environmental changes evident in the Southwest, examination of government

policies, initiatives and practices around water and shrimp farming were key, including poldering, river dams in India, groundwater over-extraction, and the rapid expansion of shrimp farming. Participants in the villages linked fluctuations in salinity to embankments, the capturing of waterways for private aquaculture, 'land-grabs' describing the filling-in of waterways for building development, siltation and damming. As one institutional representative said, the claim that current salinity was the result of climate change was "*complete trash*" and the elevation of climate change as a key factor in environmental changes had been done in haste. Rather, current salinity was more the result of the Farakka Barrage, but indicative of future potential impacts [Dhaka, 26]. This is supported by Dasgupta et al. (2014: 4) who argue that coastal Bangladesh is a warning case for other coastal regions also at risk of storms and sea level rise.

The declining salinity in both Fakirhat and Baintola offer an important counter to the prevailing trend in the Southwest, and indicate key opportunities for adaptation. An academic at Khulna University argued that in these cases as well as others, salinity has declined when infrastructure associated with the shrimp industry has been destroyed, indicating that it is these structures that are responsible [Khulna, 5], discussed above with regards to the Blue Revolution. Similarly, in areas where rivers have died, communities had seen a decline in salinity, allowing them to return to previous occupations.

Farakka Barrage

People in Fakirhat and Hurka, as well as institutional representatives, talked about the impact of the Farakka Barrage (discussed in Chapter Four), in reducing river flows and allowing for greater tidal flows from the ocean. Karim, a farmer in Fakirhat [Fakirhat, 8] explained that "*30 years ago, water used to come from the North, and now water comes from the south".* As one participant at the Hurka Disaster Management Committee described,

> *The main reason for salinity is that, the hilly water flow was disrupted when a river in our area dried up. The river is dead now. That's why the pressure of sea water is high in this area and the saline water comes into this area and makes the water salty…. there are more small rivers and those have dried up or the flow of water is disrupted,*

> *that's why water cannot flow to this area and because of this, the pressure of salty water is severe here.*

One departmental official argued that salinity was not about climate change, but rather a political issue stemming from the damming of the nearby Gonga River, with reduced fresh water flows allowing for up-river flow of sea water [Khulna, 4]. As one local level government officer [Hurka, 14] argued, salinity is not just a matter of climate change, but a political issue, with the Farakka Barrage blocking water, and allowing for the upland flow of sea water. One academic [Dhaka, 26] also argued that fluctuations in salinity seen in Fakirhat and Baintola could be explained by the politics of the Farakka Barrage. He argued that salinity had increased significantly as a result of the dam, particularly between 1989 and 1995, when the water sharing treaty had failed. In 1996, the rekindling of the agreement saw water levels into Bangladesh increase, thus easing salinity.

Polders, Embankments and Coastal Infrastructure

Many institutional representatives pointed to polders, embankments and coastal infrastructure as the biggest environmental challenge facing the Southwest region. In Hurka and Chitolmari, the success or failure of embankments had significant impacts on the environmental and agricultural conditions in the villages. One environmental NGO leader [Khulna, 8] discussed the 1970s-1980s 'Coastal Embankment Project', initially designed to protect crop land from salinity, with sluice gates allowing for the control of water and tidal flows. This, he argued, had had a significant and negative impact on the coastal area, implemented with little concern for the local environmental conditions. As he described,

> *The local people know nothing about what is really going on, it is all government driven. These are totally man-made changes, not climate change.*

One academic [Khulna, 18] questioned the salience of any climate change program in a landscape so altered, while one departmental official [Khulna, 3] described polders as being "*against nature*". One institutional representative described embankments as *"pseudo-security"* [Khulna, 5], advocating for systems such as 'Tidal River Management' (TRM), a process that focuses on the land, on flood processes, and supports natural processes – Bangladesh, as he described is a *"land …still growing and being created"* [Khulna, 5]. One

departmental representative [Khulna, 3] described salinity as a "*man-made problem*", the result of polders initially developed to prevent salt water intrusion, along with introduction of shrimp. Another government official argued that while embankments might have helped agriculture, they had a negative impact on the fisheries sector, inhibiting rivers, and the movement of fish and shrimp [Khulna, 9]. Some degree of salinity, he argued, was meant to come naturally, and a combination of science and local knowledge was needed, *"to let rivers flow"* [Khulna, 9]. *"Eco-friendly"* initiatives were needed, that work and adapt with the environment, not against, and he put embankments in this negative category. These opinions stand in contrast to the national governments approach to adaptation in the Southwest, and policies within the BCCSAP.

Some institutional representatives also discussed the impact of coastal development [Khulna, 5]. A representative from a legal NGO [Khulna, 8], for example, explained that while climate change was a crucial issue, unplanned development was to blame for salinity and waterlogging. One academic at Khulna University expressed a similar sentiment [Khulna, 11] arguing that a lack of coherent planning was leading to harmful practices in terms of development, infrastructure, urbanisation and the practice of filling in water bodies for construction. Another academic discussed the need to focus on "development hazards" including salinity and waterlogging by looking at local environmental issues [Khulna, 5]. Indeed, such arguments link to Iqbal's (2007) research, which attributed a number of environmental issues, including river siltation and resultant flooding, to the mismanagement of railways in the 1800s and 1900s.

Sea Level Rise

Despite a popular view of Bangladesh as going under water, there were mixed reports on the projected likelihood of rising sea levels. Only one participant in the case study villages discussed the risk of sea level rise, as well as a small number of institutional representatives, and this was not considered a pressing concern. Institutional representative reports at times contradicted scientific reports, revealing the complex interactions between sea level and land levels. While one institutional representative felt that any sea level rise would be counteracted by sediment deposits [Khulna, 5], other studies argue rather that the delta is subsiding, with the potential to exacerbate the impacts of sea level rise (Hanebuth et al. 2013; Pethick &

Orford, 2013; Schiermeier, 2014). As Pethick and Orford (2013) argue, local factors including sedimentation, land subsistence, restricted fresh water river flows, and estuary embankments all need to be taken into account. One institutional representative was adamant that no sea level rise would be observed in Bangladesh, due to sedimentation [Khulna, 5], while other research suggests that this claim is only true for 'pristine' areas free from embankments, where sedimentation can reach (Auerbach et al, 2015).

Summary and Discussion

Drawing on political ecology, this chapter has examines each of the case study villages in terms of their environmental exposure and sensitivity linked to livelihoods and political processes, as well as examining broader narratives and arguments regarding environmental change in the Southwest.

The environmental challenges facing the case study communities were found to emerge largely from local and national political processes, which suggests the need for climate change to be rooted in contextual understandings. In particular, the exposure and sensitivity of these communities is created in the interactions between rural livelihoods and agricultural practices, which have been reconfigured by NGOs and governments for export-focused agriculture. The Blue Revolution, the Green Revolution and coastal and river infrastructure, have undermined local ecologies and narrowed livelihood opportunities, creating new vulnerabilities for communities in already exposed areas. The advent of climate change serves to exacerbate these issues.

Each village was found to be exposed and sensitive to a range of environmental changes that include climate change, but more importantly, included local environmental changes bound to local political ecologies. In Baintola and Fakirhat, the communities were dealing with the aftermath of the Blue Revolution; these communities were seeing declining salinity as a result of river-deaths, but were still bound into the shrimp industry for their livelihoods, with a particular sensitivity to fluctuations in salinity. In Hurka, salinity was enduring and widespread, with aquaculture as the only farming livelihood available. Exposure to salinity could be traced to the village's southern location, access to tidal rivers, storm surges following Aila and Sidr, and the entrenched aquaculture industry. With little opportunity for

agricultural diversification, the community's sensitivity was high, and the risk of seasonal food insecurity was evident. In Chitolmari, water security was a key issue, with an embankment protecting the village from salinity, but cutting the village off from water for drinking and irrigation. The groundwater was affected by both iron and arsenic, and without access to electricity, filtration systems were scarce. Without access to water, the village was experiencing sensitivity to changes in rainfall, temperature and seasonal variations reported throughout the region.

There was evidence of climate change reported in each of the villages, despite little knowledge and understanding of climate change. Communities reported changes in rainfall patterns, the loss of six seasons, and increases in temperature, alongside a history of natural disasters, including cyclones Aila and Sidr, that revealed gaps in disaster management and disaster governance. While Aila and Sidr cannot be attributed directly to climate change, these gaps indicate future vulnerabilities.

However, communities, as well as government officials, academics and other institutional representatives, were more concerned with locally bound, political and "*man-made*" issues. Similarly, farmers, both men and women, were more concerned with the impacts of local issues that could be traced to political, economic and agricultural interventions. Similarly, while the impact of climate change was considered to be of concern by many institutional representatives, local environmental challenges were found to be strongly linked to political and economic processes and agricultural interventions.

The 'crisis narrative' regarding climate change in Bangladesh is countered by a strong local discourse that focuses on local and regional environmental issues. Climate change looms as a magnifying glass, an overlay likely to exacerbate existing environmental challenges. However, rather than decontextualising these challenges, adaptation efforts will need to target these local issues as underlying causes of vulnerability. A decontextualised approach to adaptation is likely to result in minimal measures, or risk maladaptation.

The following chapter, Chapter Six, explores the social aspects of vulnerability and resilience in each of the case study villages, examining the ways in which the environmental changes discussed here manifest via gendered roles and relations.

Chapter Six: Vulnerability and Adaptive Capacity – Gender, Poverty and Knowledge

Introduction

Vulnerability describes the capacity of communities to respond to stress placed on their livelihoods and wellbeing (Adger & Kelly, 1999), and includes both exposure and sensitivity to environmental hazards and the capacity of a system to adapt to these changes. As Chapter Five highlighted, the communities of Baintola, Fakirhat, Hurka and Chitolmari were exposed to a range of environmental changes rooted in historical environmental and agricultural interventions and exacerbated by climate change. This chapter examines the sensitivity and adaptive capacity of these communities, considering key social, economic and political factors that shape community experiences of environmental change.

A number of internal and external social factors linked to environmental vulnerability have been identified in literature from Bangladesh. Ahmed (2006) highlights lack of knowledge, limitations in governance, poverty, and limited investment in agriculture as barriers to effective adaptation. Akter and Mallick (2013) consider the links between poverty and vulnerability, situating vulnerability as a consequence of unequally distributed resources. As Leichenko and Silva (2014) argue, poverty compounds vulnerability, with poorer families having fewer assets to help recover from shocks or changes. They are more likely to live and work in exposed areas and engage in livelihoods that rely on natural resources. In addition, some authors have begun to examine gender inequalities and the challenges faced by women in the face of environmental change (Alston et al., 2014; Cannon, 2002; Demetriades & Esplen, 2010). As findings from this literature suggest, experiences of environmental change and the capacity to respond, are shaped by the economic, political and social entitlements available to, and commanded by communities. Analysis of entitlements examines the resources available to communities, distribution and access within communities, as well as the structural setting within which these entitlements are produced, contested and distributed (Adger & Kelly, 1999). As such, this chapter explores the question:

> *How do social, political and economic inequalities shape the experiences of environmental change in Southwest Bangladesh?*

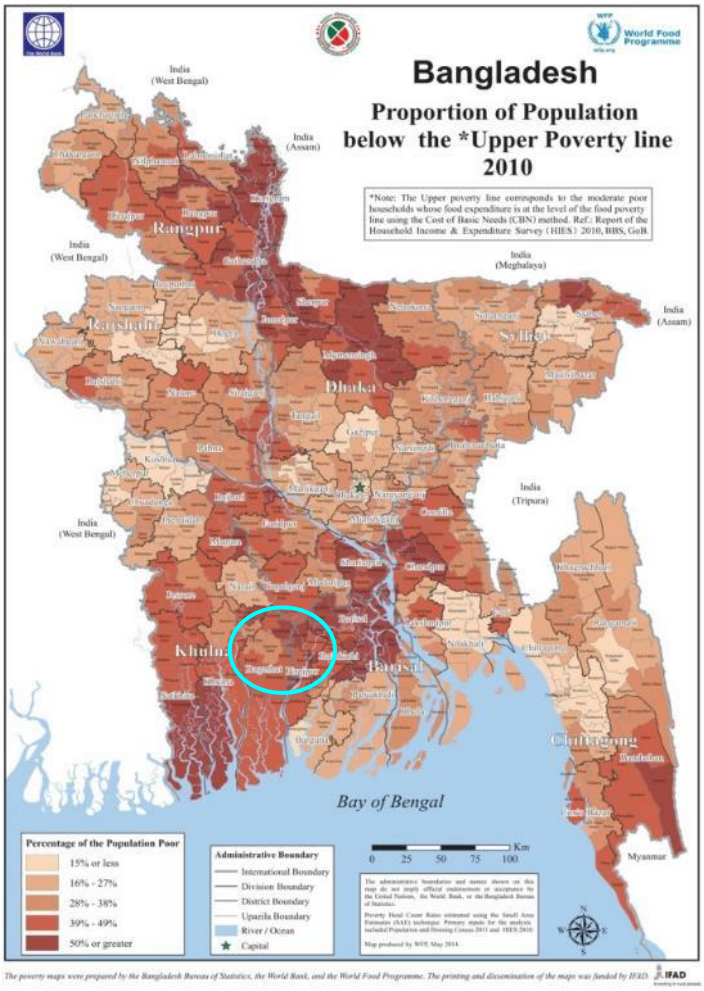
The following findings draw on interviews, focus group discussions and participatory activity outputs conducted in the four case study communities. Three key findings emerge. Firstly, the adaptive capacity of these communities was constrained by multi-faceted poverty, by narrowing opportunities and limiting command of resources. Secondly, gender inequality created gendered experiences and vulnerabilities. Drawing on Allen and Sachs' (2007) theorising regarding the gendered politics of food, women were found to be engaged in both material and sociocultural work, but their access to livelihoods, land, money, food and decision-making powers remains constrained. Thirdly, drawing on theory related to socially just adaptation, limited knowledge regarding climate change, and limited education, diminishes opportunities and abilities to adapt proactively. These factors can be conceptualised as underlying mechanisms contributing to vulnerability. These findings provide the basis for analysis of adaptation initiatives in Chapter Seven.

Poverty and Vulnerability

Poverty relates to a lack of access to resources and a narrowing of options; in terms of vulnerability, poverty affects the ability of communities to proactively respond to risks or recover from extreme events (Adger & Kelly, 1999). Baintola, Fakirhat, Hurka and Chitolmari villages were all in areas with moderate to high levels of economic poverty, and, as a result, food insecurity (see Figure 6.1). Within the communities, there was evidence of multifaceted poverty and inequality. This was linked to limited political, economic and social entitlements afforded to small-scale farming communities, influencing the sensitivity of the communities and hampering adaptive capacity. Poverty was also was leaving communities with diminished options for forward planning or opportunities to diversify livelihoods. Poverty was also found to intersect with gender, leading to gendered inequalities in access and entitlements to agricultural resources for poor women.

In each of the villages, precarious economic conditions were listed among the most pressing challenges that communities were facing. In focus groups, men and women discussed "*a crisis of employment*", "*economic crisis*", "*unemployment*" and limited work for both men and women.

Figure 6.1: Bangladesh Upper Poverty Map 2010



Source: World Food Programme (WFP) (2014)

The underlying reasons attributed by the communities included decreasing agricultural income, cost of technologies and inputs, limits in off-farm work and limited access to land. As such, small-scale agriculture and the communities' direct reliance on natural resources were contributing to sensitivity to environmental changes. The communities were all relying primarily on agricultural livelihoods in increasingly constrained environments. Agriculture was no longer seen as a viable option for family livelihoods alone. Many people talked about the increasing costs associated with agriculture – irrigation, modified seeds, fertilisers and pesticides, animal feed, aquaculture fry[10] – alongside the low cost received for produce. Fish

[10] Newly hatched fish or shrimp

and shrimp, for example, were experiencing some decline in price, alongside declining production. As Ganaka in Baintola [FGD 4] explained,

> *No, agriculture alone is not enough for a family. Agriculture can only produce the food crops for a family. We cannot live only by eating, there are many more needs. There is cost for education, health, accommodation and everything comes from the family. If a family member works outside or does a job other than agriculture, that family is well-off economically here.*

Economic poverty was impacting on the future and forward planning of families. Many families had ambitious plans for their children, and were looking to invest in their education. However, most families had limited future plans in terms of the livelihoods and farming. When asked what they would do next year, most families felt that they would continue with their current patterns of crops and livestock. Nilima in Fakirhat [Fakirhat, 3] argued that since the area did not support diversified crops – such as jute, or other cash crops – her family had no choice but to pursue aquaculture each year, and depend on a narrow range of products. Some families in Fakirhat had found themselves in cycles of debt that inhibited their opportunities for experimentation or diversification. These families were taking out *macha* loans – micro-loans exclusively for aquaculture – at the start of each season, to stock their ponds with fish and shrimp fry. By the end of the season, families had been able to pay off these loans, but accrued little else in terms of savings. The *macha* system then compelled them to take out loans the following year, which they would then have to invest again in shrimp farming. Such systems trapped families in cycles of debt that limited proactive planning for the future.

For others, poverty was serving as a barrier to accessing credit that could be invested in adaptation. Some families facing severe poverty reported excluding themselves from microcredit projects, confirming research that microcredit cannot reach those families most in need (Amin, Rai, & Topa, 2003). Ponni in Fakirhat [5] had been employed as a field staff member for the government's '*Ektee Bari Ektee Khamar*' (EBEK)[11] microcredit programme, but did not herself apply for a loan, as she felt her family would not be able to pay it back. As Shompa in Fakirhat indicated, microcredit loans were creating cycles of poverty. She

[11] 'One House One Farm' Government Run Microcredit Programme, designed to offer lower interest rates than NGOs.

explained that because her family had no loan, the local government official had deemed them not to be vulnerable, and had excluded them from receiving a VGF (Vulnerable Group Feeding) card.[12] Indeed, while microcredit is often promoted as a key tool for building adaptive capacity, and opening access to adaptation technologies and techniques, microcredit was serving to re-enforce class and gender divisions.[13]

Linked to this lack of forward planning was a lack of social safety nets provided by the government, indicative of the level of the minimal support available for adaptation. While some community members reported receiving support from the government or NGOs during times of need, these initiatives were not uniform, and at times followed a clientelist pattern between governments, political parties, NGOs and community members. Bansuri, whose family was landless, and whose husband had ongoing health issues, had a VGF Card the previous year, but was no longer eligible, and was unclear as to why [Baintola, 5]. By contrast, her neighbour Nisha was in a similar situation, and had never received a VGF card [Baintola, 9]. Manda, a widowed woman in Hurka [10], also expressed confusion regarding eligibility and access, saying,

> *My card has gone. If you get one year, you can't get another for the next five years….I had a VGF card before, but there are conditions. After five years, I will be eligible again. The duration of my card has expired…. three years have passed, so in another two years, I will get another one…. But I don't know whether I will get the card in two years because there is an age limitation. If I am too old, I won't get the card….*

Jamini in Fakirhat [Fakirhat, 6] described a flawed and limited system, with some degree of patron-client relationships with local government representatives, saying,

> *They sometimes give us rice and wheat as relief. I got the help for two years….Now I won't get that again…The [local government] member was our neighbour and he*

[12] . The 'Vulnerable Group Feeding (VGF) Card Program', provides food for low-income and vulnerable groups who cannot meet basic needs as a result of natural disasters or social circumstances, such as age, illness or disease.

[13] See section titled 'Microcredit' in Chapter Seven for further discussion.

included our name…. The card holders change every year. If ten people get the card this year, another ten will get it in the following year.

Similarly, in Hurka, Saranya [Hurka, 5] felt that access to government supports had improved when the Awami League Government had come into power, suggesting some degree of clientelism and poor governance, saying:

After the Hasina Government, conditions have changed…. We got a house, but before her [Sheik Hasina], we didn't get anything. Sometimes I get wheat from the government…. VGF card is provided to us by the local government.

Beyond food, some people had reported receiving assistance to rebuild property after storms, but this too was inconsistent. As discussed further in Chapter Seven, with regards to disaster management, inconsistencies in government engagement, limited resources, and poorly planned responses, hampered community resilience.

People criticised the government for lack of assistance, echoing findings discussed above regarding social support. One academic argued that in the absence of political stability, the government could not be relied upon as a source of employment [Khulna, 16]. In Chitolmari [FGD 2], one group of men argued that many jobs, including government jobs, required a bribe for employment, which they could not afford; while their sons were educated, they had no spare land to work on, no off-farm work, and were idle. In Hurka, Kalpana [Hurka, 9], who was working for a local NGO, said,

If we get enough employment facilities, it will be good for us… We need jobs. Can you do that? We are unemployed… We need help but not through the [local government] members or Chairman. They don't give us anything…. In our country, those who get things first consume the whole thing, and don't think about the other people.

While alternative and off-farm employment was highlighted as key adaptation option by institutional representatives and the communities (see Chapter Seven for further discussion), communities stressed the lack of available alternatives. This was linked to the broader poverty in the region, lack of assistance from government, and limits in quality education. In

particular, women stressed the lack of work available for them, in part as a result of responsibilities that kept them at home.[14]

Land Rights

In addition to the lack of viable livelihoods, the limited availability of arable land in Bangladesh, and a complex land tenure system, was leaving farming communities in precarious situations, compounding poverty. With the increasing pressures on natural resources, security of access to land constituted a key factor in adaptive capacity, giving communities and families buffer zones for livelihoods and food security, and areas for experimentation and diversity. Despite Bangladesh having a high proportion of arable land (around 59 per cent), the large population and small country size puts pressure on available land. Agricultural land has also declined over the past decade (Hasan, Hossain, Bari, & Islam, 2014). In addition, inheritance laws that allow for the division of land – varying according to religion – have resulted in diminishing plot sizes and complex tenure arrangements.

Under these diminishing plot sizes, some families we spoke to were functionally landless, owning the plot of land that comprised their house and pond, and little else. Lazuli [Baintola, 12], talked about how inheritance divisions between sons over the last two generations had diminished their once large ancestral land. Nawrin [Hurka, 11], whose husband had died a number of years earlier, explained that an already small plot of land had been divided between her late husband and brother-in-law; Nawrin had not been deemed the owner, despite legislation to protect widows, and the boundaries between these two properties were unclear.

Various reports of land capture by elites further demonstrates the links between poverty and political marginalisation. In Baintola, shrimp farming had resulted in years of dispossession for local land owners, with businessmen from outside the region taking control of large numbers of shrimp ponds. In Hurka, many families had lost land as a result of infrastructure for the proposed Rampal coal-fired power plant, with insufficient remuneration and reports of corruption. People felt powerless to defend their land and rights.

[14] For further discussion on women's livelihoods, see Chapter Seven, 'Women's Agency in the Context of Adaptation'.

Landless families faced a different set of vulnerabilities to families with land. Landless families were buffered to some extent from changes in the environment, but still vulnerable to fluctuations in off-farm job availability, which are affected by environmental changes. While families with land were facing the degradation of their natural resource base, landless families were already missing these resources, and had been forced to diversify their livelihoods. Nawrin and her children in Hurka [11], were functionally landless, and relied on her and her son finding day labour. She reported a "*crisis of work*" that they faced during the rainy season, and as a result, poverty and food insecurity that was seasonal. In discussion with Mithee in Baintola [9], we asked about the impacts on salinity. With no land, her husband sold bananas and did day labour. She noted that when the salinity was high in the area, there was less day labour available. Beyond this, however, she was unsure of the effects of salinity – with no land, she felt that they were not directly affected. What this indicates is attention to how climate and environmental changes affect not only farmers, and those directly reliant on the land, but those on the peripheries and along rural agricultural networks. Adaptation initiatives that encourage off-farm work need to consider these flow-on effects. Ultimately, those families with access to land reported being better off in terms of income and food security than those without, with the ability to grow their own food, which was widely considered better in terms of access, quality and cultural value. Many families noted that they felt better, economically and nutritionally, when they could grow their own food.

Gendered Inequality and Vulnerability

Within this structural environment of economic constraints, the following discussion examines the evidence of gendered inequality found in the case study villages, where gendered norms around food, production, work and caring, access to knowledge, land and decision-making, have diminished community adaptive capacity. Much literature has focused on the marginality of women with regards to environmental changes (Alston et al., 2014; Cannon, 2002; Demetriades & Esplen, 2010). While there are issues with generalisations within this literature (Arora-Jonsson, 2011; Resurrección, 2013), these arguments provide insights into the ways in which gendered inequalities are perpetuated via the environment, and the need for adaptation to incorporate gender justice (Tschakert & Machado, 2012). Important intersections lie between gender and class, as well as age and marital status, with

social categories influencing social norms, behaviours, roles and responsibilities (Sultana, 2009).

Gendered divisions of labour and gendered access to material resources are important in understanding gender relations (Chafetz, 1990), and are reflective of vulnerability. In the context of entitlements, gendered restrictions diminish opportunities for both men and women to engage in diverse and alternative livelihoods. In rural Bangladesh, gendered divisions of labour are typically seen as aligning with a public/private divide, with women denied access to wage-earning roles. Amin and Pebley (1994: 122) argue that in Bangladesh, few agricultural roles are considered "appropriate for women". Gendered social norms generally do not allow for women to earn income or own land. Rather, women remain largely dependent on men for key elements of food security (Government of Bangladesh & IUCN, 2013). However, Bangladesh has also seen a significant 'feminisation' of agriculture in recent years (Sheuli, 2013) and, as found in the field, women's work often extended beyond the home, but without equivalent increases in status or entitlements. To discuss gender relations, I have drawn thematically on the work of Allen and Sachs (2007), who have defined gendered engagement with food via three domains: 1) socio-cultural (household work); 2) material (income generating work); and 3) corporeal (individual food security). Such an approach allows for an examination of women's work across "the formal economy, informal economy, and household economy" (Allen & Sachs, 2007: 15).

Applying Allen and Sachs' (2007) domains, Table 6.1 combines information on gendered roles and responsibilities from focus groups and interviews, in terms of tasks that were considered women's, men's and shared between both.

Table 6.1: Gendered Divisions of Labour

	Women	Combined	Men
Socio-Cultural Domain	• Cooking and serving food • Caring for children • Caring for parents • Collecting drinking water • Collecting cow dung • Making fuel sticks • Cleaning the home yard • Cleaning clothes • Milking cows • Selling eggs and milk at homestead • Helping husbands • Educating children • Drying rice in courtyards • Looking after domestic hens and ducks • Domestic work in other people's houses • Stitching, making and repairing clothes	• Caring for children • Bearing the cost of education of children • Looking after cattle • Collecting grass for fodder • Storing food • Decision-making • Planting and looking after vegetables • Day labour • Collecting seeds (for non-hybrid crops) • Collecting wood and grass for fuel *(except in Hurka)*	• Medication for animals • Collecting fuel (exclusively for men in Hurka, where local fuel is limited) • Drinking tea at tea stall

Material Domain	• Processing snails *(in Fakirhat)* • Collecting sunflowers *(in Chitolmari)*	• Farm work and field work • Rice work • Mud cutting (digging ponds and canals, raising homesteads or farms) • Looking after crabs *(in Hurka)* • Planting and watering sunflowers *(in Chitolmari)*	• Planting and collecting rice • Irrigation • Buying fodder straw at markets • Cultivating and catching fish • Jobs and small business work • Preparing crab fields *(in Hurka)* • Buying crab food at markets *(in Hurka)* • Processing sunflower oil *(in Chitolmari)* • Applying fertilisers and pesticides (except in Chitolmari, where women also took part) • Feeding snails to fish • Marketing • Buying and selling vegetables • Garage work • Carpentry • Buying seeds (for hybrid crops) • Land owners • Transport

Source: Compiled by author from interviews and focus groups

Socio-Cultural Domain

Gendered spatiality, and a heavy bias towards home based work, exacerbated women's vulnerability in a number of ways. Firstly, as outlined in Chapter Five, during disasters many women felt unable to travel to cyclone shelters from their homes, while their husbands, already out of the house, were able to do so. Secondly, these divisions are linked to an undervaluing of home-based and socio-cultural work, in terms of land and resources, constraining the capacity for meaningful of adaptation in these areas.

Women were still predominantly responsible for work in and around the home, including home-based, 'socio-cultural' food work (Allen & Sachs, 2007) (see Table 6.1). Cooking, cleaning and collecting water was solely the domain of women in most cases. Women were also largely responsible for maintaining homestead food production, including looking after gardens; looking after free-range chickens and ducks; milking cows; and processing food, such as drying rice and coconuts in areas around their homes. This work was crucial to household food security. As one NGO staff member [Khulna, 14] stated, food insecurity and poor nutrition among children was rarely the result of a lack of knowledge on the mother's part – rather, this was linked to limited access to food, or a lack of knowledge among men, more likely to be the ones shopping for the family. As Panchi [Baintola, 14] said,

> *The condition of women's nutrition is not too bad. Because women practice fowl [and] duck rearing, they have also homestead vegetables and fishes in the pond.*

Homestead vegetable gardening gave women an opportunity to provide supplementary food for their families, as well as small amounts of income.

Water

The access and use of water crossed socio-cultural and material domains, and reflected important gendered sensitivities. Serious changes were taking place with regards to the availability of surface water (declining river flows, variable rainfall, and salinity) and groundwater (salinity) (detailed in Chapter Five). Broadly reflecting other research from Bangladesh (Sultana, 2006; 2007b), water was found to shape and re-inforce gendered spatialities and "culturally appropriate notions of femininity and masculinity" (Sultana, 2006:

363). Women were largely responsible for household drinking water, and men responsible for agricultural water and irrigation. Questions to both men and women regarding the engagement of men in household tasks, in particular collecting water, cooking or cleaning, was often met with laughter. Some men said that they would help their wives with these tasks during an emergency, but when questioned further, revealed that this had never happened. Tuhin [Hurka, 3], a local government representative and crab farmer, when asked if he ever helps his wife with cooking or collecting water, said:

> *[Laughs]. No. Actually in our society they [women] do that kind of work and men don't help them. Basically women do the cooking and collect water.*

Given the future projections regarding scarcity and quality of water in the region, these gendered divisions around water work foreshadow stresses for women. Long-term planning for drinking water security was limited – only two families interviewed had rainwater tanks, obtained by the husbands via personal connections with local elites [Hurka, 8; Chitolmari, 3]. While some women reported storing water in large pots during the dry season, this practice was limited. In Chitolmari, the lack of electrification mean that women were collecting water affected by iron and arsenic.

Men, conversely, were dealing with a range of issues in accessing and storing water appropriate for agricultural irrigation – water for material purposes. In Baintola and Hurka, declines in salinity had been the result of a large canal, linking to a nearby river, becoming silted and blocked to the point where no water flowed. Without this link to the river, salty tidal flows were no longer able to reach the areas. As such, agriculture in Baintola and Fakirhat relied on storing rainwater in ponds and local canals throughout the year, and extracting water with petrol pumps, which men noted as being costly and difficult. In Chitolmari, the lack of access to surface water and pumps meant that water for agriculture was collected manually.

The political ecology of salt and salinity was having gendered impacts. In Baintola and Fakirhat, while lower salinity meant safe water for drinking, bathing and cleaning, and better for crops, the declines in shrimp production were noted as negative, particularly in terms of income. Some men reported actively adding salt to ponds that were no longer salty enough for salt-water shrimp, with negative results. These findings suggest diverging goals between men and women's responsibilities with regards to water. While much gender and climate

change literature highlights the stresses on women in water-constrained environments, this literature gives little attention to the stresses placed on men, and men's work, under the same conditions.

Cattle

There was widespread discussion regarding the pressures on animal husbandry in Bangladesh, particularly with regards to cows, which offered multiple benefits to families, as a long term investment for milk, cow dung, and sale of calves. Interviews and focus groups established that women were doing much of the day-to-day work of caring for cows. Both men and women were involved with feeding, collecting grass from common areas, taking cows out to common areas to graze and taking cows for vaccination. Men were responsible for administering medicines. Women were tasked with milking. In addition, women were closely involved in the gathering, processing and use of cow products, milk and dung. Preparing cow dung fuel sticks, for example, was solely the task of women, as discussed by Parveen (2009), reinforcing the gendered nature of cooking and food preparation. As fertilizer, cow dung was often being used by women for growing vegetables, with men involved with chemical agriculture for rice and other cash crops. As Nipa [Baintola, 17] described,

> *We use both organic and chemical fertilizer…. we use urea in the rice field, and cow dung on the vegetable garden.*

Such divisions suggest the level of investment within families towards women's work. While families outlay significant sums of money for the chemicals and other inputs required for men's work, women relied on home-based spaces and resources to maintain their work.

As such, the pressures of climate and environmental change on the health of cattle was having particular impact on women. Environmental pressures over time had reduced the number of cattle in the region, as discussed by a number of institutional representatives. Cattle and other animals remained at homesteads during cyclones – Aila and Sidr had killed livestock and poultry and washed away fish. Many people reported the destruction of animal shelters, and some people noted that they had not been able to re-establish the numbers of animals they had had prior to the cyclones.

Fluctuations in salinity across the field sites had impacted upon the availability of food for animals, and livestock had suffered from a decline in grazing land and fodder, as a result of intensification of agriculture. Bijola [Fakirhat, 13] and Tesnim [Baintola, 3] recounted the earlier period when their villages suffered from high salinity, and the cows suffered from disease, and limits to food and water. Salinity, and shrimp farming has had similar outcomes in reducing the amount of grazing land, either now taken up by ponds, or unable to support grasses – in the Bagerhat region, there is little to no grazing land left, due to salinity. In saline affected areas, livestock and poultry were also prone to a range of diseases that were not well understood [Khulna, 4] but required farmers to buy a range of medications. As one woman in Hurka described [Hurka FGD 2],

> *Now the cows can't drink the outside water. When they feel thirsty they come to home and drink sweet water here. But in the past they drank the outside water. There is saline water everywhere. So the cows come home and drink water from here.*

Some families also reported selling their cattle during times of economic stress, including Kalila [Baintola, 10], whose husband has been disabled in an accident. Roktima [Baintola, 2] however, said that her family had decided to buy cattle and chickens as a result of financial stress. This example demonstrates the difference between coping and adaptation. Adaptation and diversification is available to those families with some degree of solvency, while coping by selling off assets may offer short-term benefits, but restrict options in the longer term.

Agency in the Sociocultural Domain

Women were exercising agency in ways that focused on, and re-inforced, their agency and identity in the 'everyday' and 'personal' (see Coulthard, 2012) of the socio-cultural domain. When asked why women were doing the majority of household tasks, women highlighted that they were already at home looking after children, elderly or sick family members, so these home activities were available to them. Rather than seeing themselves as bound to do these tasks, women felt that they had an opportunity to invest their time in these home activities, with caring as the key factor that keeps them at home. Ajmina [Baintola, 15] for example, said: "*I prefer to work from home, to care for my children".* While her husband was capable to helping her, Momotaj [Chitolmari, 2] said that household work – including cleaning,

cooking, making fuel sticks, processing coconuts for oil – *"is MY work".* While this may be an example of a patriarchal bargain, women expressed their identity and agency through this idea of work at home being their responsibility, and important to their own identities and value within their family, rather than their burden.

Gendered divisions of labour also gave way to spatialised and time-bound processes and power relations. Women often also stressed that their husbands were too busy to work around the house, as they were engaged with work away from the village. Those men who did help with household tasks, did so depending on the time they had available. However, women also felt that men had much more idle and free time. When asked to list tasks that men and women do around food, women in Hurka [Hurka FGD 3] included "*spending time at the tea stall*" as a key activity that men do. When asked why women don't also spend time at the tea stall, they indicated that they don't have time, and would not know where to go, and nor anyone to pass the time with. This suggests limits to social and spatial capital, which may constrain women's ability to engage in broader decision-making processes, or build connections for collective action.

Only in a few interviews did women or men explicitly state that women's mobility, and access to opportunities and spaces beyond the village, were curtailed by men's directions. Momotaj [Chitolmari, 2] mentioned that her husband did not want her to work outside the home, but within this was a linked idea that, as women stay at home, home-based work was their responsibility. Rather, many women indicated that their role at home was part of a negotiation between husband and wife, but with consideration of tasks that were considered non-negotiable, such as child care. This theme is discussed further in Chapter Seven.

Material Domain

Alongside their socio-cultural responsibilities, women were increasingly involved in 'material' work (Allen & Sachs, 2007), including on-farm work, off-farm work and accessing markets. As findings from Parveen (2009) indicate, the division of labour in rural Bangladesh is represented more by the absence of men in household tasks (as indicated above), rather than the absence of women in on-farm and off-farm commercial work. Nationally, there has been a significant increase in women's participation in formal employment, with much of this

attributed to the garments sector (Nazneen et al., 2011), and the feminisation of agriculture (Sheuli, 2013). While the garments industry has yet to reach the Southwest, the feminisation in agriculture was confirmed, with many women engaged in both paid and unpaid farm work. However, barriers were found in terms of women's access to on-farm and off-farm work, as well as women's opportunities to control and make decisions regarding income from this work. Indeed, divisions in the material domain further reflect labour divisions based on the ability to earn and control money.

On-farm Work

Men were largely responsible for on-farm work, including ongoing work to care for rice and ghers which could be a short distance from their home, or in an adjacent village or upazila (sub-district). In many cases, it was difficult to find men to talk to during the day, as they were outside of the village.

However, women were often called on to offer unpaid work in the family farm, or some paid work during planting, transplanting or harvesting periods. In this way, women were deployed in times of economic need, which could be seen as an adaptation of women's gendered norms for material benefit. Both men and women stressed that involving women on family farms was a way to avoid hiring outside labour, which might be expensive or in-accessible. As Sultana (2012) notes, the lack of choice in poorer families can lead to greater equality and sharing of jobs. In Baintola, for example, one wealthier family were able to afford outside labour to run their broiler chicken operations. The women in the family, as such, were not required to do this work. Widowed women conversely, as discussed below, were able to access a range of off-farm work.

However, most women also stressed that they engaged in this work from a desire to help their families and their husbands. Bulu and her neighbour Dina [Fakirhat, 7] (in Image 6.1) in Fakirhat, for example, were involved with cutting rice for transplanting on land owned by a neighbour. They explained that this was a task usually engaged in by men, but open to women when men were busy with other work – Bulu was doing this to help her husband, who had been contracted to transplant the rice, and each were being paid 200 taka per day. Both noted that they would be able to use this income for their children. When Dina's husband

arrived, both headed back to their homes to cook lunch, indicative of the multiple roles and spaces these women occupied.

Image 6.1: Bulu and Dina Cutting Rice for Transplanting

Source: Author

While some villages reported an increase in women's work in the field over the past 10 years [Baintola, 14], in Hurka, where agricultural production was low, both women's and men's field-based involvement had contracted – shrimp work required much less day-to-day labour. Indeed, this lack of work as a result of environmental damage and mono-culturing is indicative of the sensitivity of the community in Hurka. This was contrasted against Chitolmari where cash crops, and, in particular, sunflowers had boosted the on-farm work for both men and women. Women there argued that "*no-one is just a housewife*" [Chitolmari FGD 2].

The use of farm inputs including pesticides and fertilisers also represented an important facet of the material aspects of farming communities, indicative of those domains of farming in which families are willing to invest. As reported in focus groups, the costs of these inputs was a significant financial strain. Despite expressing concerns about the use of chemicals on food (as discussed in Chapter Five with regards to the Green Revolution), many families stated that they were using chemicals, including pesticides and fertilisers, for their larger-scale rice and vegetable production. Across all communities, the application of chemicals was seen as a

man's job (see Table 6.1), with the exception of Chitolmari, where women were involved with chemical application for sunflower production (discussed in Chapter Seven). Chemical inputs were seen as particularly important for 'hybrid' varieties or rice and vegetables, hybrid being used to describe a wide range of new varieties, including high-yielding varieties, and adaptive crops tolerant to flood, saline or drought (discussed further in Chapter Seven). This investment in field-based agriculture represents an investment in men's work, and women's limited engagement in the use of inputs indicates a growing knowledge gap between men and women.

Access to Markets

Women's limited ability to access markets was constraining their capacity to make financial decisions and command resources with regards to agriculture, and was limiting their ability to engage in meaningful adaptations. With the exception of widowed women, most women were unable to access markets themselves. 'Marketing' – including selling produce at markets, and purchasing food and other goods – was considered a man's role in all of the case study villages. Women faced limited mobility, and gendered expectations around who would handle buying and selling of goods. Women also often relied on men to buy animal feed from the markets, including straw, chicken feed, snails and fish feed. This lack of access to animal feed was particularly prevalent in Hurka, where wild-grown fodder, such as grass, was unavailable, due to extensive salinity.

Homestead based production that women were engaged with – such as raising poultry for eggs – similarly relied on the support of men for buying and selling goods. Institutional representatives [Khulna, 17], as well as women themselves, talked about how women relied on either their husbands or sons taking good to market for sale, or men from other villages knocking on the gate to buy goods. Men were observed in Hurka buying eggs from door to door. While interviewing Reshma in Baintola [Baintola, 7] a man came to enquire about purchasing broiler chickens. In Fakirhat, regular roaming sellers were also observed, selling shoes, clothes, incense and snacks. There were also regular processes of exchange and sale within villages and between neighbours. In Chitolmari, community members were selling excess eggs and sunflower oil. My research assistant and I also occasionally purchased goods from families we interviewed.

There were mixed reports of women's ability to control the income from this homestead work. Some women, like Tesnim [Baintola, 3], gave to their husband when needed – "*I keep the money, mostly, and from time to time I also have to give some to my husband"* – while Ajmina [Baintola, 15] said she kept some for emergencies, but gave most to her husband. This limited access to income earnings – both in terms of control, and the small amounts of income generated by homestead work – was similarly observed in adaptation initiatives, as discussed in Chapter Seven.

Off-Farm Work

Off-farm work represented a diversification of income, but also a diversification in terms of reliance on ecologies and natural resources for livelihoods and wellbeing. In addition to marketing, men were predominantly seen as responsible for off-farm work including day-labour, transport work, on-selling processed or fresh food or running shops and repair businesses. In focus groups, women listed 'work' and 'business' as men's tasks, referring to paid work outside of the village. Those women who were engaging in work outside of the village – selling produce, doing day labour or working in the professional sector – were predominantly widows (detailed below). Only two married women interviewed were working outside of the village, and both were educated women with higher economic standings – Maduri [Fakirhat, 1] worked for an insurance company, and Orchona [Hurka, 2] had been a women's representative in the local government. In Chitolmari, community members reported that some young unmarried girls had gone to work in the garments sector, with the assistance of an older, unmarried woman. In the other villages, when asked about garments work, people reported that with no nearby factories, women were unwilling, or unable, to access this work.

Access to off-farm work was hampered by broader structural barriers. In focus groups, both men and women highlighted the lack of available jobs. Many women expressed a desire to work, but felt that there were limited opportunities acceptable for women. Sana in Fakirhat [11] argued that while only men were the income earners at present, women needed more working opportunities, and recognised that the work they did on the family farm or in the home, was not sufficiently valued. Jaina in Hurka [Hurka FGD 5], said,

> *We agree that women have equal rights, and we think we should come forward to achieve this. The responsibility for nurturing and looking after the family falls upon the women…but our other work is not valued.*

Many women felt that women, as well as men, had internalised social norms regarding women's roles and responsibilities. One woman in Hurka [FGD 5] saying,

> *The women think, why do I need to go outside for work? I am happy with my husband and children. This does not depend on the husband alone – it also depends on women's outlook. They think that they are fine, with their household chores, like cooking, looking after the children. So why I would go outside for work?...They have a lack of mental support and consciousness. They think, we don't have any wish to go to work outside. We just want to stay home and I am well here.*

As such, both patriarchal structures, and women's own agency, where maintaining gendered divisions of labour. However, as demonstrated, women's work spans formal, informal and household economics (Allen & Sachs, 2007), but is valued differently to men's work in these spaces. As detailed further in Chapter Seven, gender-sensitive responses chart a path for improving practical conditions for both men and women within these gendered divisions, while gender-transformative approaches seek strategic changes for equality and entitlements (see Allen & Sachs, 2007; and Moser, 1989).

Land Ownership

Indicative of women's limited command of assets and resources, women faced barriers to owning land. Much research has indicated the flow-on discrimination resulting from women's lack of land ownership. Women are unable to qualify for government agricultural assistance, such as an Agricultural Input Assistance Card, without having land registered in their own names (IRIN, 2011). Amin and Pebley (1994) argue that social status in rural areas is linked to access and ownership of land, with women having to rely on their fathers, husbands or sons. Given the links between land ownership and food security (Harris-Fry et al., 2015), land ownership is an important factor in adaptive capacity.

Lack of land ownership meant that women had fewer opportunities for growing and earning, eroding their adaptive capacity. Of all the women interviewed in the case study villages, only one married woman reported owning land, having come from a family with only girl children. Land ownership was similarly difficult for women who were widows. Manda [Hurka, 10], for example, lived with her family on land that was still in the name of her dead father-in-law, and would eventually pass to her son, but not her. A number of widowed women also reported engaging in a land exchange practice known as *bondok* – a land mortgage system whereby a tenant pays the land owner for the land, and is able to farm the land until such time as the landowner can repay the mortgage amount. Shirina [Fakirhat, 12], whose husband had died of a stroke, had mortgaged her land in *bondok* to pay for her daughter's wedding. Loli [Fakirhat, 14], also a widow, had mortgaged two aquaculture ponds in *bondok* to repay a large microcredit loan that her son had taken out (see further discussion on the gendered nature of microcredit in Chapter Seven). In Chitolmari, Jalapa [Chitolmari, 4] had mortgaged the family land after her husband had left on a religious pilgrimage, and both her sons had been disabled in accidents. Both Jalapa and Loli said that their food security had diminished after undertaking the *bondok* mortgage. Without access to this land, their earning and growing capabilities were diminished. None of the families engaged in *bondok* could envisage when they could repay to loan. For each of these families, *bondok* represents a coping mechanism – a measure that ultimately erodes their entitlements and capabilities, in order to survive.

Religious and cultural conventions, as well as national laws, make it difficult for women to own and inherit land. Manda [Hurka, 10] justified her lack of ownership over her family land based on religious convention,

> *Manda: This land was in the name of my father in law.*
>
> *Interpreter: The land is not in your name?*
>
> *Manda: No.*
>
> *Interpreter: Will your daughter get the land as inheritance?*
>
> *Participant: No. In our rules women don't get land as inheritance.*

Other research suggests that as little as 10 per cent of land in Bangladesh is owned by women, and an even smaller proportion of agricultural land (Kieran et al. 2015). Both Hindu and Muslim laws allow for women to inherit less land than men, indicative of broader structural barriers.

Decision-Making

Women's decision-making capacities and entitlements were constrained at the local level, indicating limits to adaptive capacity. Nationally, Bangladesh is considered to have good levels of women representation – the constitution also safeguards a quota of 50 seats exclusively for women in parliament (outlined in Chapter Four). At the Upazila and Union levels of government, there is a requirement to have some women representatives. However, as Nazneen et al. (2011) argue, improvements in women's wellbeing in Bangladesh have not been matched by structural and institutional improvements in terms of political engagement, beyond symbolic and consultative roles. Rather, what was observed was a degree of participatory exclusion (Agrawal, 2001), with women involved in nominal and passive ways, rather than active participants.

We spoke with three women in Hurka actively involved in the local government – Jaina, involved with a Union women's group [12], and Orchona [2] and Subrata [14], who both occupied women's reserved seats in the Union Council. A number of women were also involved with the Ward Disaster Management Committee (DMC) in Hurka [Hurka FGD 4]. Poli in Baintola [14] was also involved with the Union via the DMC. Jaina [Hurka, 12] expressed the challenges that women face in representation, saying that,

> *In our area, there is an election in every ward. Men compete in the election, and women compete for the seats reserved for women. The thing to remember is that, women cannot compete for the general seats, for the position of member. The traditional system supports men to compete directly. Women cannot compete for any seat other than the three reserved seats in the union council.*

A Women's Department representative in Khulna similarly discussed the challenges that women Union representatives face, with expectations that they would take direction from their husbands [Khulna, 17]. In an interview we conducted at an Upazila Office, the women

representative was openly ignored and mocked by men colleagues. Orchona discussed her role at the Union as limited to distributing food to women in need, and some advocacy regarding access to water and wells. These examples demonstrate the challenges faced by women in governance processes, and the limitations of quota seats to effect structural change. These examples also sit within a broader governance environment regarding climate change and gender. As detailed further in Chapter Seven, there was limited engagement with gender in the major climate change policy, the BCCSAP, and limited implementation of key policies. The Women's Department representative in Khulna, for example, had no knowledge of the national climate change policy. In terms of opportunities for adaptation to address gendered inequalities that contribute to vulnerability, these governance issues serve as limits to adaptive capacity.

Corporeal Domain

The corporeal domain examines women's relationships with food, health and their bodies. As Gutierrez-Montes, Emery, & Fernandez-Baca (2012) argue, in times of poverty or vulnerability, women often negotiate access to resources at their own expense. Cultural norms in Bangladesh dictate that while women are responsible for cooking, they are usually the last to eat. The pressure on women to eat last was enduring, and a number of participants talked about the pressures on women's health and nutrition. In Fakirhat and Hurka, women talked about the preference for men and children to eat first. As Neera [Hurka FGD 2] said,

> *This thing is very common in every family. We share the food always. If some food is left after feeding all the members like children, father in law and mother in law, then we eat.*

There was no evidence of sons being preferenced over daughters in terms of meals, aligning with arguments by Munro and Mcintyre (2014) regarding the changing nature of son-daughter preference, and meals as a patriarchal tool. However, the bias that women placed on themselves suggests the enduring pressures on women to maintain the socio-cultural realm and provide for their families. This echoes Alston and Akhter's (2017: 1460) arguments regarding "intra household consumption smoothing", whereby women's entitlements are further limited within the home during times of stress.

While undernutrition remains high in Bangladesh, particularly for women, many women reported having reasonable personal and family food security, with most reporting eating three meals a day. Women in Hurka [Hurka FGD 2] linked improvements in household food security to greater knowledge among women, but also smaller family sizes. With fewer children, and a move away from multi-family households, it was more likely that there would be food left over for women. As Neera [Hurka FGD 2] said,

> *In the past there was joint families, but now we have single families so the number of people is less. So at least we can share the food.*

In Fakirhat, women reported that nutrition in the community had improved as a result of more "*consciousness*" as well as better income – women here argued, "*men waste money*". They also pointed out that they are more conscious to use their own produce, saying that 20 years ago they would "*sell all the milk*".

However, some families did report annual periods of seasonal food insecurity or stability, and the case study region has been classified by World Food Programme (WFP) as having moderate to high levels of food insecurity, as a result of economic poverty (WFP, 2013). The phenomenon of seasonal hunger in Bangladesh is known as *monga*. While no families reported serious lack of access to food, many talked about the gap between their own food production, and the periods of time when they needed to rely on the markets, and across all the villages, the ability to grow subsistence food was seen as desirable. Many linked periods of food insecurity to periods of low income or work. Those families who relied on day labour, in particular, noted the lull in work during the wet season that impacts on their capacity to buy food. While not exclusively affecting women, the presence of *monga* indicated the intersections between class and agricultural livelihood in terms of vulnerability. Projected changes in rainfall patterns and storms (discussed in Chapter Five) could serve to exacerbate seasonal patterns of food and livelihood insecurity.

Constraints and Opportunities for Widowed Women

Outcomes for widowed women, or women whose husbands were away, was often very different to that of married women. As Sultana (2009) writes, attention is needed on the intersections between gender and other social categories, including age and marital status.

Widowed women in other marginal categories, such as in precarious employment or indigenous groups, are often considered 'ultra poor' (McIntyre et al., 2011), and at greater risk of food insecurity and health implications, facing a 'double burden' of both material and socio-cultural work. Challenges faced by widowed women are linked to the "patriarchal risk" (Kabeer et al. 2011: 4) describing husbands providing access to resources not otherwise available to women.

The widowed women we spoke to had been forced to re-craft gendered expectations and find ways to access the resources that their husbands had previously facilitated. While in many ways they were successful, these women faced persistent legal and social barriers. As Bushamuka et al. (2005) argue, women in marginal economic positions cannot afford to adhere to social norms around women's mobility and seclusion. Rather, these women must learn new skills in new spheres to contribute economically to their families. Without the income of a husband, these women were forced to go outside their homesteads to find work, including day labour or helping in neighbours' homes. Widowed women were also able to access loans without the surety of a man. As Sen (1999) and others have argued, the expansion of women's economic capabilities often contributes not only to improvements in wellbeing, but improvements in agency, triggering broader social change.

In Hurka, Manda's [Hurka, 10] husband had died of a stroke, leaving her to care for her children and mother-in-law. After her husband's death, Manda feared for her daughter's safety, so arranged for her to be married. Recognised as a widow and vulnerable person, Manda's name was included on a list maintained by the Union office, giving her access to paid work with the government twice a year. When we spoke with her, Manda was in the middle of 40 days of "*mud cutting*", manual earthworks for a canal and road. Manda also worked on other people's land, and looked after a small crab pond and productive vegetable garden. Despite being the earning member of the family, the land that Manda lived on remained in the name of her dead father-in-law, and would eventually pass to her son (see above regarding women's access to land). She was also the carer for her children and elderly mother-in-law, and had cared for her husband when he was ill. During the last cyclone, Manda and her family had not been able to travel to the cyclone shelter, and had hid under the bed. After her husband's death, Manda had had to learn new skills, saying, "*I work more than in the past. When my husband was able to work, I didn't understand anything*". Manda was reflective of the changing social norms regarding women in Bangladesh. She explained,

> *In Bangladesh women are given different opportunities. In comparison to the past, women are joining outside work like jobs. In our childhood we didn't see women get out of the house, but now women are walking in the same field as men. They are given rights.*

In Fakirhat, Bijola [Fakirhat, 13] had been left with a large debt after her husband had died, and her son had abandoned his wife and children, moving to India. Bijola now cared for her son's children. Bijola was running a milk reselling business, caring for neighbours' cows, collecting the milk, and selling it to a nearby sweets store. She was able to find new ways to build resources – through negotiation with her neighbours, in a cow-lending system called *rakhali,* she would gain ownership of calves borne from cows she had cared for, saying,

> *Three years back I had only one cow but that was not mine. I took it as a deal, like cow rent. After the cow gave birth to a calf, I became the owner of the calf.*

Bijola's business could be seen as an opportunity for her as a single women, an example of empowerment beyond patriarchal control, contributing to the food security of her family and community. While some literature discussed the absence of men as an opportunity for women (Bhattarai et al., 2015), Bijola described her work not as an example of empowerment, but as a necessity, explaining that,

> *I didn't have any work. I just wondered what I would do! Then at last I started the business. As a survival strategy I started the milk business…. No one gave me the idea. Want of money gave me the idea. When there is the question of survival, ideas come automatically… Now I am old, I have become weak; I can't work in the farm, in the field, but I need to live. That's why I work…*

As Rashid (2013) argues, outcomes for single women are highly dependent on their social capital, and women strive to maintain cultural and social expectations and identity. This was also true for married women, who sought opportunities for adaptation and diversification while maintaining their commitments to their families. For these widowed women, leaving the "patriarchal risk" (Kabeer et al., 2011: 4) had served to improve their resilience, but barriers such as lack of social safety nets and lack of access to land ownership emerge as further barriers to ongoing adaptation.

Vulnerability to Natural Disasters

Despite significant gains in disaster management throughout Bangladesh, access to cyclone shelters remains a key deficiently, contributing to the sensitivity of these communities to serious impacts. Baintola and Fakirhat villages were not in close proximity to a shelter and people listed the lack of accessible shelter as a key concern. Priya [Baintola, 14] indicated,

> *There are only two cyclone centres. One is in the south-east corner of Baintola union and another one is at Baruipara that is at the end of north-west corner of Baintola union. So, in this region, there is no house high enough or no building, and when the signal is given for a cyclone, they face difficulty in coming to a safer place to take shelter.*

Samreen [Hurka, 1] reported taking shelter at the electricity booster station, and others going to stay with neighbours with concrete homes. Jaina [Hurka, 12] reported,

> *No, no. I wasn't in the cyclone centre…. Because there was no cyclone centre during the cyclone. We took shelter under a big water tank adjacent to the highway…. My house was broken. The whole area was a total mess, it was full of debris. The area was flooded. Sanitation was destroyed.*

Bansuri [Baintola, 5] reported staying at home, separated from her husband who was at the markets. Mithee [Baintola, 9] reported that with no shelter nearby, they had stayed in their home, which was partially destroyed. Tesnim [Baintola, 3] and her family stayed in their cow barn. Hurka was the only village with a nearby shelter – a shelter was built in 2010, which also served as a primary school (see Image 6.2). Hurka was also the only location with a functioning disaster management committee (discussed further in Chapter Seven).

Image 6.2: Cyclone Shelter and School in Hurka Village

Source: Author

The sensitivity of women to natural disasters was exacerbated by gendered divisions of labour. A number of women reported being unable to move to a cyclone shelter, as they were caring for children or ill family members alone, indicative of the impacts of socio-cultural and caring work on women's vulnerability. Manda [Hurka, 10] reported that she was caring for young children, as well as her husband and father-in-law who were ill,

> *No, my husband was sick, my father-in-law was sick. How could I go? How could I take all of them to the cyclone centre?... We took shelter under the wooden bed. My little children, husband, father-in-law, we were all under the bed. How could I take all of them? I just did what I was bound to do.*

Such findings support broader research from Bangladesh regarding the dangers faced by women in the face of natural disasters, including the risks to their lives and safety (Egert, 2014).

Local Knowledge and Vulnerability

Education and knowledge emerged as third a key area of inequality, both in terms of access, and the ability to have knowledge meaningfully utilised in decision-making. Knowledge

regarding climate change among village participants, as well as government officials, was low, presenting a barrier to meaningful and socially just adaptation. This was the result of limited education, limits in governance, and failures by NGOs. As found in Chapter Five, people were aware of changes taking place in the environment, and the impacts these changes were having on their livelihoods. While local policy-induced changes were understood, understanding of the causes and implications of climate change was limited. The majority of village community members, when asked about climate change – translated into bangla as *jolobayu poriboton* – said that they did not know what this meant, or did not understand. To overcome possible issues with translation and terminology, in later interviews we also used the terms 'global warming' and 'greenhouse effect', with similar responses. A notable response came from Bijola [Fakirhat, 13] in Fakirhat,

> *Interpreter: Have you heard about climate change?*
>
> *Bijola: Who is climate change? Is he a man? I don't recognise him.*

Of all the people we spoke with in the villages, only two participants – a man from a local disaster management committee [Hurka FGD 4], and Ganaka, a farmer in Baintola [Baintola FGD 4], were able to discuss the global causes, links to CO_2 emissions and implications. Ganaka, educated to high school level, explained,

> *Ganaka: … huge amounts of carbon-dioxide are produced, released into the atmosphere. Because of this carbon-dioxide, the sun rays cannot get back to where they came from…. the sun rays remain on the surface for a long time. It takes a long time for the sunrays to go back from where they came from. That makes the atmosphere warmer and increases the temperature…. Different chemical industries are spreading, and the deforestation is behind this. New mills and factories are growing….That is why the ozone layer is becoming weak and sun rays are directly coming here but failing to go back….*
>
> *Researcher: How did you learn about this?*
>
> *Ganaka: I completed my HSC. My background was science…. Only the teachers know about this. The science teachers know about this.*
>
> *Researcher: Are you worried about the impacts of climate change?*

Ganaka: Yes. Of course.

Researcher: What kind of impact do you think it will bring?

Ganaka: The seasonal impact. During winter we feel warm and during summer too much heat, there is either no rain in the rainy season or excessive rain. Our area is in the southern part of Bangladesh. The salinity rate is increasing every year. The sea level is rising too. This is because of the melting of ice in the two poles of the earth. It is melting because of carbon-dioxide, that is why the sea level is rising. Our house was on low land before. We have cut soil and raised the house.

Ganaka was an outlier in the villagers, with most people unable to discuss the cause or effects of climate change. These findings align with other research from Bangladesh (Anik & Khan, 2012). However, recent research by Ahsan and Brandt (2016), carried out in Bagerhat and Satkhira, found significant levels of knowledge among male farmers, arguing that their practical experience with extreme weather events enhances their understanding and perceptions of risk.

Despite not understanding the mechanisms behind climate change, some people drew inferences to describe environmental changes. In some interviews, participants said that they did not know what climate change meant, but thought that this might describe changes in seasonal variation, rainfall and temperature. In Baintola, men described climate change as including earthquakes, salinity, changes in rainfall patterns, the loss of the six season pattern, loss of trees, and increases in heat [Baintola FGD 2]. Indeed, these findings demonstrate a high degree of local knowledge regarding *changes in the climate,* which need to be incorporated into adaptation processes. However, communities were without knowledge regarding *climate change*, particularly the political basis and ramifications. In terms of socially just adaptation, this lack of knowledge excludes communities from achieving procedural justice, claiming their rights under domestic and international law and engaging in debates regarding policy and funding.

When discussing this lack of knowledge with academics and institutional representatives, many were aware and were not surprised. Many did not perceive this lack of understanding as a problem. As one NGO leader discussed, people in the villages may not know about climate change in a technical way, which he described as *"bookish knowledge"*, but people can

certainly see the changes taking place, and the impacts these changes are having on their lives [Khulna, 13]. As one local government representative [Khulna, 24] said,

> *Yes – this is what I noticed, they don't know about the climate change and other things, but they know! They do know that salinity is increasing, they don't know the reason, but still they have knowledge…. they always they tell me that we can't drink water, we can't use water, it's saline, there are the problems… but I don't think they know the term climate change.*

Many institutional representatives in Dhaka and Khulna argued that, despite not knowing the meaning of the phrase – *jolobayu poriboton* – 'climate change', local people are able to recognise changes, and would be able to adapt, despite this lack of knowledge, as this is what they have always done. However, this lack of knowledge has implications for meaningful and just adaptation, particularly considering the long-term and unprecedented nature of climate change. A staff member from one local NGO felt this lack of knowledge was pervasive and a barrier to adaptation. They argued that while people in Bangladesh are good at adaptation to changing situations, people can't identify climate change or changes, or link changes they were observing to broader patterns. The staff member attributed this to the challenges of low education [Hurka DMC]. As Alam, Asad and Parvin (2015) found in their work in Khulna, indigenous knowledge failed to predict the severity of the cyclone Aila in 2009. The predicted impacts associated with climate change are likely to be beyond what communities can cope with using local and indigenous knowledge.

In addition, as Ahsan and Brandt (2016) argue, extreme events such as sea level rise and cyclones cannot be addressed at a local level alone, requiring collective movements that understand the regional and global causes of climate change, contextualised and addressed at the local level. Without an understanding of the broader causes and implications of climate change, and the need to long-term planning, communities will be ill-equipped to adapt to these changes. Conversely, people in the villages were aware of the local political economies and ecologies that were affecting their local environments. These local insights indicate the local conditions underpinning their vulnerability, and the capacity for local level collective action and advocacy.

The lack of knowledge regarding climate change may be linked to limited institutional government support and knowledge. The local lack of knowledge regarding climate change

existed despite a large number of NGOs and government agencies running climate change adaptation initiatives in the region and in all of the case study villages. This included climate-smart aquaculture in Hurka, a climate resilience project in Baintola, climate field schools in Fakirhat and sunflower farming in Chitolmari. These projects had not, however, involved conversations with communities regarding the political and environmental basis of climate change. In Baintola, one participant reported that, while they did not know what climate change was, they knew that recently, "*different NGOs went from school to school"* [Baintola FGD 4]. This example of NGO education and conversation around climate change was an outlier. This represents an abuse of power by NGOs, who are receiving funding for climate change work, but not engaging in meaningful conversations with communities, as would be expected in participatory and ethical development practice.

At the local government level, knowledge on climate change and national climate change policy was limited, helping to explain the lack of knowledge at the village level. Many government officials themselves lacked an understanding of the ways in which climate change might impact on farming, with limited understanding of the policy setting, and limited local knowledge often due to short-term rural postings. A number of officials were also not aware of the major national climate change policy (Bangladesh Climate Change Strategy and Action Plan, discussed in detail in Chapters Four and Seven). This structural environment does little to foster the adaptive capacity of exposed and sensitive communities, whom are lacking the avenues and resources to fulfil their rights under these policies. Echoing findings at the local level, knowledge regarding climate change and national climate policy among local government leaders was limited. Many government officials were not able to articulate clearly the causes or outcomes of climate change. While some local level officials were better able to explain predicted outcomes, few were able to articulate the causes, or the complexity of impacts such changes would have.

Broader limitations in access to quality education were also creating structural barriers to environmental knowledge. Some families highlighted barriers to children accessing education. In Fakirhat, women highlighted the lack of good secondary schools [Fakirhat FGD 1], while men argued that outside tuition was still needed for children to get a good education [Fakirhat FGD 3]. Narwin, whose husband had died, had her son withdraw from secondary school in order to work and support the family [Baintola, 11]. In this case, a lack of social safety nets was perpetuating a pattern of educative and economic poverty for Narwin and her

family. Manda [Hurka, 10] also explained that poor roads also served as a barrier to children accessing schools. These limits in education serve as barriers to adaptive capacity, re-enforcing the limits in climate knowledge, poverty and narrow livelihood opportunities.

However, there was evidence that the next generation would enjoy greater levels of education. Across all sites, a significant growth in girls' education was noted, with current rates of girl's enrolment indicated to be at either 75 per cent (Hurka and Baintola) or 100 per cent (Chitolmari and Fakirhat). This growth was attributed to the government stipend introduced in the 1990s (see Nazneen et al., 2011), and increased consciousness that both girls and boys can and should and can be educated. Changes in family composition were also credited for improvements in education. In Fakirhat, women noted trends towards smaller families, improved the capacity and will to educate both sons and daughters. Women also linked smaller family sizes to the increasing age of marriage [Fakirhat FGD 2]. In Baintola, women felt that improved income from the 'shrimp boom' had opened opportunities for girls to be educated. In addition, women felt that investing in their children's education would lead them to have better paying jobs in the future. A small number of families with daughters in their late teens talked about delaying the marriage of their daughter so she could study or find work while many with young daughters talked about hoping they could get a good education. Improvements in education were also seen to have a flow on effect in other spheres of women's lives, including delays in marriage and dowry. Such findings are indicative of the potential goals of transformative adaptation.

Summary and Conclusions

While Chapter Five considered the environmental changes taking place in the communities, and the interactions between livelihoods and environmental factors, this chapter has explored the key social factors affecting the sensitivity and adaptive capacity of the case study communities, and experiences of environmental change. Political contexts, multifaceted poverty, gender relations and knowledge emerged as key factors influencing adaptive capacity and sensitivity, constituting the underlying mechanisms of vulnerability.

Multifaceted poverty was a key factor constraining adaptive capacity. Poverty is a key factor in the social construction of vulnerability, indicative of a lack of access to resources needed

to face risks and stresses on livelihoods, and a narrowing of options, affecting the ability of communities to alleviate risks, or recover from extreme events (Adger & Kelly, 1999). Importantly, poverty alone is not an indication of vulnerability (Akter & Mallick, 2013; Leichenko & Silva, 2014). However, poverty increases the likelihood of exposure and sensitivity to environmental changes, and can diminish the options available to families and communities. Declining terms of trade in agriculture were stretching family resources. The communities lacked access to off-farm work opportunities – even further constrained for women – leaving them with few alternative options to respond to the environmental and economic constraints they were facing. Social safety nets and NGO support were patchy and inconsistent. Families without alternative options were forced to adopt coping mechanisms, such as removing children from school, or engaging in risky land leasing deals. Indeed, access to land constituted a significant factor in terms of vulnerability and food insecurity. Those families without land were forced to rely on unstable local job markets, and faced the risk of seasonal hunger. Climate change will likely exacerbate poverty further, both directly and indirectly, including impacts on agricultural production and increasing food costs (Leichenko & Silva, 2014), and the increasing costs associated with agriculture, accessing water, seasonal hunger, and seasonal unemployment, suggest that this may already be happening.

Gendered divisions of labour around food, production, work and caring, access to knowledge, land, and decision-making, compromise the capacity for communities to adapt by inhibiting the entitlements of women. There was evidence of an enduring public/private divide in terms of women's and men's work, with women's tasks concentrated in the socio-cultural realm. This led to a lack of mobility that was constraining women's safety, as well as women's economic and social capital. In terms of adaptive capacity, this has significant consequences, with a large proportion of the community unable to engage in alternative livelihoods, or draw on social connections for ideas and opportunities. There also remained a persistent undervaluing of women's home-based work that constrained the capacity for meaningful adaptation in this space. Women's work was found to span across the material and socio-cultural domains and there was evidence of women's increasing engagement in farm-based work, with a number of tasks that were considered shared. However, women's work was valued differently to men's work in these spaces. The sharing of farming and food production tasks did not necessarily translate into seeing these tasks as open to any person at all times – gendered perspectives on responsibility remained. Reflective of the "elasticity" of women's

time (Moser, 1989: 1814), tasks were seen as shared depending on who had time and ability to help. 'Time', however, was often reflective of broader gendered divisions between paid and unpaid work (socio-economic divisions), as well as mobility, as demonstrated by men being able (having the time and social capital) to pass time at tea stalls. In addition, women's engagement in the material domain was often seen more as a way to reduce farm-based costs, rather than as a legitimate role for women, demonstrating the value attributed to women in these spaces.

Despite these divisions, there was evidence of improvements in gendered inequalities over time, including the increased access to education, declining birth rates and declines in early marriage. These changes give insights into how gendered norms can, and do change, and the opportunities for adaptation initiatives to address these challenges. However, as will be discussed in Chapter Seven, the majority of adaptation responses observed serve to reproduce existing inequalities and as such, vulnerabilities.

Limited knowledge regarding climate change, and limited education represents a further injustice for affected communities, and may exclude them from procedural justice. Lack of knowledge is linked to a lack of recognition (Schlosberg, 2012), meaning that these communities cannot be appropriately or justly represented in climate policy and discussion. This is important on a global climate justice level in terms of rights and responsibilities for funding and response, as well as on a local level, whereby communities are unable to engage in the drafting and implementation of policy and projects that affect them. Limited understanding of the long-term nature of climate change also opens communities to the risk of maladaptation, and indicates ethical failings by NGOs working in this field.

The factors discussed here constitute the underlying mechanisms leading to community vulnerability. As detailed in Chapter Five, the case study communities were facing exposure to a range of environmental challenges, as a result of intersecting political and agricultural interventions, in concert with climate change. The capacity for communities to deal with these changes, and transform their livelihoods, daily practices and environments, were constrained by the challenges discussed here – poverty, limits in knowledge, and gendered inequality. As such, in order to alleviate the vulnerability of communities, socially just adaptation responses need to address these factors. Chapter Seven builds on these findings,

examining how adaptation initiatives interact with these social mechanisms, with a particular focus on the capacity of adaptation initiatives to pursue gender equality.

Chapter Seven: Understanding Adaptation – Governance, Gender and Agency

Introduction

Chapter Five examined the socially constructed nature of environmental change across the case study communities, arguing that exposure was the result of natural hazards, climate change, and political interventions. Chapter Six examined the sensitivity and adaptive capacity of the case study communities, arguing that gender inequality, sensitive livelihoods, lack of knowledge and multi-faceted poverty were contributing to the vulnerability of these communities. In this chapter, I examine adaptation within the context of these vulnerability determinants. I discuss the political ecology of climate change adaptation in Southwest Bangladesh, looking at the ways in which adaptation initiatives interact with the social, political and environmental underpinnings of vulnerability, and the ways in which men and women negotiate adaptation in relation to social, political and economic norms.

In the contexts of climate and ecological changes, adaptation is broadly defined as "responses to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities", responding to risks associated with gradual changes as well as disasters (Turnbull, Sterrett, & Hilleboe, 2013: 154). A growing body of research suggests that endogenous factors within communities, including perceptions of risk, knowledge, ethics and culture, have an impact on the success of adaptation initiatives (Adger et al., 2009). In particular, development and climate literature has begun to examine gender as a key power structure that may influence adaptation outcomes. Carr (2008a), Bee (2013), Bhattarai, Beilin, and Ford (2015) and Choudhury, Haque and Habib (2016) all provide findings suggesting that established gender relations have an impact on adaptation outcomes.

In the case study communities, we observed a range of adaptation initiatives, with NGO-led initiatives sitting alongside a range of community-led changes in farming practices and livelihoods. In this chapter, these adaptation initiatives are considered with regards to gender and social justice, and the capacity of these initiatives to lead to transformative change. This chapter explore the research questions:

How do adaptation initiatives interact with the underlying causes of vulnerability, and how is power and agency expressed in adaptation practices?

The multiple and specific ways in which gendered inequality leave women vulnerable to environmental change suggests the need for adaptation initiatives that are gender-transformative in their approach. They must address not only the practical needs of women, but also strive for strategic needs around gender equality (CARE International, 2010). In addition, as identified in Chapter Five, locally bound environmental issues highlight the need for adaptation initiatives that function within specific environmental contexts. As such, attention needs to be given to the ways in which adaptation initiatives function within environmental and political contexts. In doing so, this chapter contributes to debates concerning the capacity for climate change adaptation as a transformative tool for gender equality, development, and social justice (Terry, 2009).

Drawing on interviews, observations and focus group discussions, I argue that there were limitations with the initiatives observed, in terms of their ability to address underlying causes of vulnerability. Firstly, I argue that broader governance was constraining opportunities for meaningful adaptation. Secondly, the adaptation initiatives observed – including handicrafts, poultry and livestock, adaptive crops, microcredit, aquaculture, and embankments – tended to be small-scale and individual in nature, with little evidence of collective action. These initiatives were predominantly recreating existing social divisions, with some evidence of micro change, reflective of actors' perceptions of wellbeing around income, health, nutrition, and culture. Communities continued to have little say in broader development processes, including in relation to major infrastructure which was eroding the local nature resource base. There was also evidence of ongoing processes of the commodification of subsistence (Bernstein, 2010) via the use of adaptive seeds and shrimp farming as an adaptation tool. Thirdly, unequal gender relations were being reproduced and reinforced via practical and home-based work for women, in part as a result of women's own agency and desires, but also as a result of micro and macro patriarchal structures and institutions.

Adaptation Governance

Local and national adaptive capacity was found to be constrained by failures of governance, political will, limited resources, knowledge, and competing development priorities around poverty alleviation (Wright et al., 2012). Despite significant progress at a national policy level with regards to climate change and disaster risk reduction, local level governance, implementation, and understanding, remained limited. This constrained the capacity for transformative adaptation on the ground.

Interviews with local government officials included questions regarding their understanding of adaptation process and policy. These discussions revealed significant inconsistencies and varied conceptualisations, based on reactive rather than proactive assumptions. Adaptation was described as finding ways to deal with changes that were currently occurring, with little consideration of interventions designed to reduce future vulnerability and risk, or address the structural underpinnings of insecurity. For example, a number of institutional representatives stressed the dynamic and resilient nature of Bangladeshi people, with adaptation as a constant part of life. A leader of an environmental NGO felt that *"In Bangladesh, people already know how to cope with new situations"*, while also stating that adaptation involves *"modernisation of processes"* [Khulna, 8]. Others participants discussed migration, and while migration has historically been a common practice throughout the delta (Etzold et al., 2013; Poncelet et al., 2010), some institutional representatives referred to migration as an indication of resilience and ability to adapt.

Coping responses, and outcomes that may be better conceptualised under 'loss and damage'[15], were also confused for adaptation. Some participants described the abandoning of agricultural livelihoods as an adaptation response. One government official, involved with agriculture [Khulna, 4] discussed seasonal migration, and farmers moving to off-farm employment as examples of adaptation. He described adaptation as moving away from occupations that were no longer meeting people's needs [Khulna, 4]. A government official involved with aquaculture [Khulna, 9] also discussed alternative livelihoods, and farmers abandoning un-viable crops. One academic [Khulna, 18] discussed the difficulty that communities might face when needing to shift employment – these processes are never easy,

[15] As discussed in Chapter Two, loss and damage describes the "negative effects of climate variability and climate change that people have not been able to cope with or adapt to" (Warner et al., 2012: 20).

and the assistance that communities may receive is often politically motivated [Khulna, 18]. Shifting occupations also relies on the assumption that alternative opportunities are available. Among communities, the government was seen as unable to provide employment opportunities, and people would instead be required to rely on the private sector, including RMG industry, remittances, export and outsourcing [Khulna, 18]. Communities themselves stressed the lack of local opportunities, with limited off-farm work available. Reshma in Baintola, for example, felt that with no alternative work, such as shops or transport work, the community had no choice but to continue shrimp farming [Baintola, 7].

There was also a bias among government officials towards small-scale initiatives that responded to current changes in the environment. Departmental officials and local government representatives discussed:

- Alternative cropping patterns
- Keeping reserves of fresh water
- Collecting river water
- Excavating ponds to catch more water in the wet season Mulching
- Raising farmland
- Growing salt tolerant crops, such as sunflowers or maize Integrated and mixed farming to deal with waterlogging
- Floating gardens
- Fast-growing varieties allowing for harvest before the rainy season
- Homestead fruit and vegetable gardening.

These micro-level approaches are indicative of an individualisation and "neoliberalisation" of resilience, whereby the responsibility of the state is diminished, with greater emphasis on resilient individuals (Tierney, 2015). Tierney (2015: 1333-4) describes this process, whereby, "adaptation on the part of so-called resilient individuals is preferable to collective resistance against" and such expectations constrain efforts to address the structural deficiencies that have produced insecurity.

NGOs represent a further major institution where adaptation is conceptualised and operationalised. Many NGO staff expressed more nuanced understandings of adaptation to that of government officials, identifying links between social issues and vulnerability, suggesting a more socially-just approach to adaptation. One NGO leader described adaptation

as a process of constant change, requiring knowledge, and initiatives to transform livelihoods. He described his NGOs work as developing people's capacity to face problems, establishing community-based organisations and aiming to address gender issues [Khulna, 13]. He also indicated the link between adaptation and 'coping' outlined *"coping mechanisms"* for farming, including a combination of *"traditional farming plus science"* such as the use of saline tolerant crops, or switching to crab culture where shrimp had become unviable [Khulna, 13].

Many NGOs were also closely engaging with the concept of gendered vulnerabilities. Many NGO staff identified the challenges faced by women in relation to climate change, talking about limited access to decision-making, resources, and the pressures associated with gendered tasks such as collective water. One NGO leader felt that while the impacts of climate change would affect everyone, those most likely to suffer would be poor people and women. In addition, he felt that women were leading grassroots adaptation processes [Khulna, 6]. Others felt that women, as well as disabled people, were most vulnerable [Khulna, 8]. However, there was evidence of a "virtuous and vulnerable" (Arora-Jonsson, 2011: 745) or "chief-victim-and-caretaker" (Resurrección, 2011) approach, whereby women were seen as victims of environmental change, and also responsible to address these changes. One local NGO leader, for example, discussed the increased vulnerability of women, while highlighting women as the main "*instigators*" and "*element in change*" [Khulna, 13]. In addition, few adaptation initiatives took these inequalities into account in a meaningful way.

As discussed in Chapter Six, NGOs working in the case study villages had neglected to discuss the causes and implications of climate change with community members, as a key element required for meaningful, and socially just adaptation. Only two adult participants understood the meaning of climate change, the global causes linked to local implications, and Bangladesh's place in the carbon economy. This represents a significant failure by NGOs, and demonstrates a limited understanding of the purpose of adaptation, and the potential for developing long-term, meaningful and sustainable options for communities. This lack of knowledge also problematises the identification of meaningful, collective and regional adaptation initiatives.

The Role of Climate Policy

As outlined in Chapter 4, the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), the major national adaptation plan, has been criticised for having an overly technocratic approach and overlooking the key causes of vulnerability (Parvin & Johnson, 2015). Limited procedural justice in the way the policy was developed extended to the ways in which the policy was understood and dealt with at the local level. Many government officials, as well as NGO staff, were unclear in interviews about the content and purpose of the BCCSAP. Communities and local officials were not aware of any projects or funding in the region that had been received via the BCCSAP, through which international and domestic funds were being distributed. One departmental official, involved in agriculture, said that climate change was not being considered by his department. He described the way in which information *"trickles down"* from the Ministry, with little discussion of climate change. As such, he felt unwilling to talk about an issue that the Ministry has not clearly communicated [Khulna, 4]. Another departmental official linked climate change to higher temperatures and stresses on water reserves, but said that the Ministry was still developing a policy that would be relevant to their work [Khulna, 9]. One departmental official acknowledged the impact of climate on ecosystems, such as the Sundarbans forest, but said that there was little climate change work happening, besides two World-Bank funded projects [Khulna, 10]. Two officials suggested that we speak with relevant Ministries in Dhaka for advice on climate change policy [Khulna, 10; 31], reinforcing the challenges of centralised governance.

For those officials who were knowledgeable about climate policy, problems persisted with coordination and implementation. As one local government representative said,

> *Everyone of us, from our level, local authority … you know that, what the policy says, but the fact is that, there is only the policy, and any program, or any specific program, is yet to come. Different ministries are working differently, not on any particular program….There is no coordination from the government, you can say that the Ministry of Environment and the Ministry of Land, maybe they have some programs…. Nothing specific, not in a particular program, particularly climate change related….*

The BCCSAP was reported to contain errors, and choice of language emerged as a simple, but devastating barrier; the policy had not been officially translated into Bangla for wider,

local use, and local actors were unable to use the policy for developing projects or pursuing advocacy. As one NGO staff member described [Khulna, 28],

> *NGO Staff 1: There is a lot of problems, the BCCSAP is in English, you know, most of the people of Bangladesh are illiterate or they can write a little bit, only in Bengali, but they cannot read English, they cannot read it, this is not in Bengali.*
>
> *Researcher: So it's not translated in Bengali?*
>
> *NGO Staff 2: Our mother language is Bengali. All is in English.*

Such a basic failure is surprising in Bangladesh, where the national language, Bangla, forms a key part of national history and identity, including the formation of Bangladesh itself. These staff [Khulna, 28] also pointed out inaccuracies in the BCCSAP regarding regional mapping and eco zones. After persistent advocacy, they were hopeful updates would be made. At the village level, no people were aware of the BCCSAP. This deficiency in governance represents a significant failure in procedural justice, with people unable to achieve their rights under a policy they are not aware exists, or cannot read.

Gender within the BCCSAP

The inclusion of gender in the BCCSAP was also limited. As one academic pointed out [Dhaka, 26], gender is only mentioned in the policy with regards to food security and disasters. The BCCSAP is accompanied by the 'Bangladesh Climate Change and Gender Action Plan' (ccGAP) which outlines concurrent action plans that dovetail with the 44 projects included within the BCCSAP, designed to ensure projects are gender responsive and transformative (Government of Bangladesh & IUCN, 2013). The ccGAP was developed via consultation workshops with civil society and relevant government departments. The ccGAP places particular emphasis on women's role in agriculture, and access to natural resources, insurance and finance, and women's involvement in community risk assessment, infrastructure development, and forestry. However, there was no evidence that the ccGAP is supported by any funding, and there were no documents outlining how these initiatives were being implemented. No NGOs discussed referring to the ccGAP, as highlighted in conversation with one NGO staff member [Khulna, 28],

Researcher: What about the Climate Change Gender Action Plan?

NGO Staff: No, there is no gender action plan, even now, only in the BCCSAP, there is a theme on gender, climate change and gender, but there is no climate change gender action plan…. I don't know if there is any gender policy.

Despite a strong policy setting, failures in implementation and communication created a weak structural environment within which people could achieve their rights and fulfil the goals of these policies.

Local-level Adaptation Initiatives

Despite the institutional limitations, people in the villages were taking part in a range of initiatives that can be broadly classified as 'adaptation'. This included a range of new farming and livelihood activities begun in the last five to ten years with the support of NGOs, or by communities themselves. While many of these initiatives were promoted by NGOs and other agencies as examples of 'community based adaptation' (Chowhan & Barman, 2005; Rashid & Khan, 2013). While many of these projects were described as CBA, they lacked key elements required in CBA approaches (see discussion on CBA in Chapter Four). In particular, genuine community-based approaches were limited. Most initiatives reflected an individualised approach to adaptation, with limited evidence of collective action, advocacy, or regional responses. In addition, many of these initiatives served to reinforce established gendered divisions of labour, rights and resources, and failed to address the key underlying causes of vulnerability within these communities.

Table 7.1 outlines the initiatives observed in case study villages. There were a range of farm-based, off-farm and homestead activities taking place. Farm-based initiatives, designed to maintain or improve farm productivity, included new cash crops; use of 'hybrid' rice and vegetable varieties; new cropping patterns and integrated farming; deepening ponds; and raising farmland and homes. Homestead based activities, designed to boost family food security and income, included free-range chicken and egg farming; rainwater collection; combined broiler chicken and fish production; livestock, including goats and cows; and handicrafts. A number of off-farm activities were also being pursued, designed to open opportunities for livelihoods that were not as exposed or sensitive to environmental change,

and giving families a diversity of options. These included day labour constructing roads and canals; selling fresh and cooked food at markets; transport using electric taxis or bicycle vans; and NGO work. There were also a number of community advocacy activities, linking communities to broader governance structures, including: a local disaster management committee (DMC) and women's group in Hurka; and a farmers' network in Chitolmari. In Hurka, there was also an NGO-led advocacy campaign for the installation of an embankment to stop saline water intrusion.

Table 7.1: Adaptation Initiatives in the Case Study Villages

	Baintola	**Fakirhat**	**Hurka**	**Chitolmari**
Homestead	• Free-range poultry • Combined broiler chickens and fish • Goats and cattle • Handicrafts	• Free-range poultry • Combined broiler chickens and fish	• Goats • Rainwater harvesting	• Rainwater harvesting
Farm	• Hybrid rice • Integrated rice, fish and vegetables	• Hybrid rice • Integrated rice, fish and vegetables • Raising farmland	• Crab farming	• Sunflowers
Off-farm	• Van pulling • NGO work	• Selling bananas	• NGO work • Selling cooked food at markets	• Driving rickshaws and vans
Community Groups	• Women's handicraft group		• Women's Group • Local Disaster Management Committee	• Farmer's Network
Advocacy			• Campaign for a new embankment	

Source: Compiled by author from interviews and focus groups

There are challenges in appropriately classifying some of these initiatives as adaptation. Many of these activities are similar to, or extensions of, established farming activities found throughout rural Bangladesh. Most participants described these activities as enhancing well-being, income, food security or health, rather than explicitly as adaptation. In Hurka, for

example, salinity and extensive aquaculture had nearly wiped out any other agriculture, and in response, many families had started broiler chickens or livestock. Toni in Hurka [2]said,

> *We have chosen these alternative livelihoods because there is now no rice or fish.*

Similarly in Baintola, where the shrimp industry had declined, Panchi [FGD 2] indicated that,

> *After the shrimp cultivation was stopped, people fall in a great problem because finding a new source of income was challenging. But somehow they adapted to the changing situation by doing some other alternative work.*

The following section explores the adaptation initiatives observed in the case study communities, and interrogates the goals and outcomes of these initiatives with regards to addressing the key vulnerability factors identified, including exposure, sensitivity and adaptive capacity.

Handicrafts

With a view to creating alternative income for the community, women in Baintola had begun a handicrafts group. In the context of climate change, this can help build adaptive capacity by opening access to resources, as well as meeting practical needs by creating diverse livelihood streams to reduce risk. In an issues-ranking activity, women listed the lack of work available to them as a primary concern – as such, women were happy to be able to find an income-generating task that they could do at home, in their spare time [Baintola FGD 2]. With the help of the local NGO, about 12 women were making crocheted toys for a buyer in Khulna city (see Image 7.1). Women were willing and encouraged to take part in this home-based initiative, which reflected a gender-sensitive and inclusion-based approach, with women making best use of the resources and time available to them within the domestic sphere.

However, as Hafiza and Neelormi (2015) argue, livelihood activities within the domestic sphere, when not linked to broader gender equality efforts, are unlikely to result in greater empowerment or alleviation of poverty. Without a focus on independence and education, such initiatives can result in exploitation, as was the case. The women were receiving very low payment for their goods – a crocheted toy took around two days to make, and would earn

50 taka per toy (around AUD$0.85). The use of income was mixed, with some women giving the income to their husbands, and some engaged with a savings group. The group were entirely reliant on the NGO to source materials, and to arrange access to buyers. As Anuva explained, the market available for their toys was poor [Baintola, 1] and many women expressed a desire for more training or government support to expand their work.

Image 7.1: Crocheted toy made by women in Baintola

Source: Author

When the initial NGO ended its project in the village, the lack of structural base left the project, and the women, vulnerable. In 2015, a new NGO had engaged the women in crocheting, and follow-up interviews revealed that this NGO had not paid the women any money for the last 6 months. They were owed collectively nearly 30,000 taka (around AUD$510).

The women, while earning some additional income, had been tied into a process of dependency on local NGOs to facilitate their work. The underlying vulnerabilities that this initiative sought to address – limited work for women, limited access to markets and narrow livelihood opportunities – were ultimately not achieved, due to a lack of education and collectivisation, or efforts to create sustainable practices that the women involved could pursue independently of the NGO. While aligning with women's desires for home-based

work, the heavy reliance that the women had on NGOs – to source supplier, access buyers, and arrange payments – meant that the initiative was unsustainable, and left the women in a situation of exploitation.

Poultry

Poultry farming was being pursued across the villages as a tool for addressing practical food security and income needs. Women in all of the villages were involved in free-range chicken and duck rearing, generally seen as low-input work, with little extra food or water to be purchased. Combined broiler chicken and fish farming (see Image 7.2) was also being pursued, with a chicken coop built over a pond, so the chickens could eat processed chicken food and the fish could eat the chicken waste. These combined systems proliferated in the Southwest after Aila and Sidr, with the support of NGOs, as they were considered profitable and requiring little homestead space. The combined method, echoing permaculture principles, also serves to reduce the sensitivity of the system to disease, flooding or storms. Lazuli in Baintola described this approach as helping families to cover potential loss in aquaculture, by not needing to invest money in fish feed [Baintola, 12]. As Nadia [Baintola, 14] said,

> *[The chicken farming is] going well. Because we are cultivating fish and poultry in the same land, if the yield of poultry is not good, then the fish can minimise the loss.*

Image 7.2: Combined chicken and fish farming at homestead pond

Source: Author

It was primarily women who were involved with much of the day-to-day work of feeding the hens and cleaning pens, echoing similar findings by Alam et al. (2009). Feeding fish chicken-waste was seen by both men and women as an efficient use of resources, and indicated women's limited access to farm-based resources. A staff member from an NGO working in the area [Dhaka, 27] argued that this practice allowed women the ability to have diversified farming operations in the home setting, where investment and resources are often scarce. Such practices allowed women to make efficient use of what is available to them, both at and surrounding their homes, while they were unable to draw on the resources that their husbands can for larger-scale farming practices. This was also important for families with limited or no land for farming, or low yields. As Tesnim [Baintola, 3] described,

> *We can't support them (the chickens) for all that they need. [So] they go outside... We can't give them more food because they eat the rice, and we also have to eat...well, we give them some. The rice yield is low. If the yield were a lot, it would be possible to give them more.*

Poultry farming can be seen as both utilising limited space and resources in novel ways, while focusing adaptation responsibilities into homes, and onto women. This practice can be seen as serving to reinforce the home as the domain of women, with women's opportunities

for food production and income generation reliant on limited resources and land found at the homestead.

Adaptive Crops and Hybrid Seeds: The Green Revolution as Adaptation

There was a widespread trend regarding the use of new varieties or rice and vegetables, to respond to drought and salinity conditions, and to help to meet the practical food security and income needs of families. In Baintola, Hurka and Chitolmari, farmers had begun to use *hybrid* and *birri* crops, terms that community members used to describe modified and high-yielding varieties developed by the Bangladesh Rice Research Institute (BRRI), and private agricultural companies. Many farmers were using salt-tolerant, flood-tolerant, and high-yielding varieties, with the support of the local government and extension officers. Modified rice and other crops have been used in Bangladesh since the 1980s as part of the Green Revolution (as outlined in Chapter 4), resulting in significant increases in agricultural production, particularly in rice (Ministry of Food and Disaster Management, 2005). Within the BCCSAP, 'climate change resilient cropping systems' and 'climate resilient cultivars' are seen as a way to improve local and national food security.

The rapid increase in the uptake and use of hybrid varieties was discussed in all of the villages in social-norm change activities. Rather than situating this switch as a way to adapt to new environmental conditions, both men and women argued that the new varieties gave greater yields and opportunities for improved income. These new crops also responded to the symptoms of environmental change, including salinity. Farmers had been encouraged by NGO and government actors to take up hybrid varieties over the past 20 years, and others had followed the example of their neighbours and family members. In Fakirhat, men talked about the *krishi* (farmer) office, as well as private companies, selling hybrid seeds since the 1970s, and rice production had expanded significantly, without the need for extra land [Fakirhat FGD]. Local *deshi* varieties were now seen as deficient due to their lower yields, while the modern varieties were demonstrated to be highly productive – as Prisha in Baintola [Baintola FGD 2] described,

> *Researcher: What about the hybrid seed? Where do they come from and why is it that so many people use them now?*

Prisha: Low production of the local varieties. That's why the use of high-yielding varieties has increased. We get the seeds from the local agricultural office. They also guide us and promote new ideas in the production of rice.

However, the introduction of hybrid varieties had also had negative outcomes that could be referred to as 'maladaptation'. Firstly, hybrid varieties had resulted in less straw available for animal feed. As Dipen and Jaimuni, rice and dairy farmers in Fakirhat, described, the local varieties of rice that they had grown in the past were taller, and there was plenty of straw for the cattle. Now they had insufficient feed for their cows, relying in grass collected at the nearby beel and straw bought from neighbours to supplement their own stocks [Fakirhat, 9]. A number of other farmers, as well as government officials, shared these concerns. The limited availability of animal feed is of particular concern given the rising trend of homestead animals as an adaptation initiative. Secondly, some communities were facing the 'limits of adaptation' (Adger et al., 2009), in terms of the conditions that adaptive crops could tolerate. No rice varieties were salt tolerant enough to cope in the conditions in Hurka, and the community had not grown rice for many years. Not being able to grow subsistence food, and having to rely on food from local markets, was seen as a struggle and a burden. Other research has argued that is some areas, particularly areas affected by Aila-induced storm surges, salinity levels have outstripped the capacity of salt-tolerant crops (Rabbani et al., 2013; Warner et al., 2012).

The introduction of hybrid seeds had also served to re-enforce, or re-craft, a range of gendered norms, particularly around the use of water, pesticides, seed saving, and women's engagement in farm-based work. Farmers in Chitolmari, Fakirhat and Baintola were engaged in integrated farming (see Image 7.3), using their ghers for aquaculture during and after the wet season, and then planting a section of the ghers with rice in the dry season, relying on irrigation. Men in Fakirhat stressed the pressures of getting access to water for irrigation, and the costs associated with either electricity or petrol. This was particularly pressing in Chitolmari, where an embankment had cut access to the nearby river, and the lack of electrification slowed options for ground water extraction. Men's concern regarding irrigation was not echoed by women – rather, women stressed the pressures on drinking water for household use.

Image 7.3: Integrated Rice and Aquaculture Plot in Fakirhat

Source: Author

The introduction of new varieties had also undermined the capacity for seed-saving, a task traditionally the responsibility of women (Oakley & Momsen, 2007). As Oakley and Momsen (2007) argue, this task involves specialised knowledge in selection and storing, requiring women to be involved in many stages of growing and harvesting. However, in areas where families have begun to diversify their livelihoods, particularly with men seeking off-farm employment, seed saving has declined alongside a general decline in agriculture (Oakley & Momsen, 2007). This was supported with findings in the villages. Tesnim, a grandmother in Baintola [Baintola, 3], explained that,

> *The seeds are bought from the market….when we were growing a local variety, I would save seeds. But with the hybrid rice, there is no need.*

Seed-saving was rare, only used for some varieties of vegetables and fruits. With the majority of rice crops, men were now responsible for purchasing seeds from the markets, or collecting seeds from the local extension office.

This was indicative of broader limits to women's agricultural entitlements. Women were rarely involved with the purchasing of seeds. While women knew that hybrid varieties were being grown, many women did not know which variety was being grown on their family farm. Few women owned farmland, or were involved with buying and selling of produce. The use of pesticides was also a task almost exclusively taken by men, with the exception of the sunflower project in Chitolmari. Many people argued that hybrid seeds require significant amounts of pesticides, and was a significant cost burden to families, but there was a general lack of knowledge about the kinds of chemicals, what they did, and how they should be applied, and why.

Women's access to fieldwork was also mediated by gendered expectations and local political economics. Observations supported a general feminisation of agriculture and, in all villages (as outlined in Chapter Six), farm based work was classified as 'combined' work, engaging both men and women. However, women's engagement in fieldwork was often based on economic imperatives. Married women were engaged within the family to avoid paying outside workers. Women who were widows also reported doing day labour work, but this was not the case for married women. Some linked women's engagement in the fields with broader ecological changes. In Fakirhat, women argued that mechanisation and improvements in their economic position, due to shrimp, had led to a decline in field work for women [Fakirhat FGD 2]. In Chitolmari, intensified cropping patterns, and the introduction of sunflowers (discussed below) had increased the availability of work for women. These findings suggest that the expectations placed on women are elastic depending on material conditions, while expectations placed on men are less open to change, demonstrating the opportunities, as well as limits, to gender-transformational change.

Sunflowers in Chitolmari

Sunflower production in Chitolmari was being pursued with the help of a local NGO (see Image 7.4) which had provided seeds and training as a way to diversify production and income. The sunflowers were being used to produce oil, and the sunflowers were considered drought and salt tolerant, responding to the symptoms of environmental change.

Image 7.4: Sunflower Oil among Sunflower Seedlings in Chitolmari

Source: Author

The project was undermined by significant gendered bias in the NGO's process. While all the men involved had attended a one-day training program, no women had been invited, and only a small number of women were engaged in farmers' groups that had been established by the NGO. However, both men and women stated that the day-to-day caring for the sunflowers was done almost entirely by women. While men were involved with preparing the land for the sunflower seeds, planting and harvesting, women were involved with the daily work of watering, fertilising, weeding, harvesting and drying. This supports similar findings by Bhattarai, Beilin and Ford (2015), who found that NGOs focused on men for transfers of skills around cash crops and technology, despite greater women's involvement in agriculture. In this case, the location of the sunflowers fields may have helped facilitate women's involvement. There were also specific spatial aspects in relation to this division of labor. The fields were close to the homes – thus close to where women would be working – while men reported being busy working in the ghers, located in a further-away section of the village.

This project could, in some ways, be seen as gender transformative. Without formal training, women had assembled knowledge from their husbands and neighbours, and women had developed a range of new skills, including the use of fertilisers and pesticides. However, by excluding women from training, the NGO had contradicted established theory regarding the engagement of women in adaptation, included objectives stated in documents from NGO

itself. Women were also not engaged in the processing or marketing, further limiting their entitlements. As Bhattarai, Beilin and Ford (2015) argue, this failure to include women can entrench social norms around farming, re-enforcing income-generating cash-crops as the domain of men and allowing men to expand their financial resources, while women continue to be responsible for subsistence (Bhattarai et al., 2015). This project is a key example of where greater attention to gendered roles and requirements might have had better outcomes. In focusing attention on the men, and excluding women from training, the project served to perpetuate existing gendered divisions. If women had been included in training, the project may have served to effect deeper social change.

On a community-wide level, the project did suggest the power of collective action, as well as the possibilities for multifunctional agriculture (Lahiri-Dutt, 2012). While the community initially felt that the project would be unviable without NGO assistance, the following year the community was able to continue sunflower farming on their own. They had sourced seeds from the market, and were assessing a mill where the sunflower oil was processed, using the oil they had produced to meet their own demands, and sell to neighbouring communities.

Microcredit

Across all of the villages, microcredit was being pursued as a key tool for maintaining farming livelihoods, thus pursuing practical needs. Microcredit has been a significant factor in social and agrarian change in Bangladesh since the 1970s, although debate exists over the motivations and outcomes, particularly with regards to gender relations and the risk of exacerbating vulnerability. In the case study villages, processes of microcredit administration were found to benefits men and men's work, by excluding women and perpetuating established perceptions around women's limited productive capacity. Without meaningful access to credit that they themselves could control, adaptation options for women were further limited.

Microcredit policies were disempowering women by undermining their capacity to obtain and use loans on their own terms, through practices of 'participatory exclusion' (Agrawal, 2001). Most of the women we spoke with had engaged in a microcredit loan at some point in their lives, and those with current loans described themselves as the 'member' of the

microcredit organisation – responsible for collecting and delivering payments, attending meetings, and having their name formally attached to the loan. However, these women also said that they required the signature of their husband or son to obtain the loan, and argued that this was a justified procedure, as approval should be sought from the person who will be earning the money to pay back the loan – in most cases, a man. This perspective was supported by a microcredit organisation working in the area. According to their criteria, a guarantee would be required from the person responsible for earning [Khulna, 19]. While some women might have the capacity to launch microenterprises, other would be deemed to have no source of income and, as such, would need their husband's signature, as guarantor for the loan. They also had policies against giving loans to women who were not married given that, if these women did get married before the term of the loan, they would move away into their husband's home [Khulna, 19]. In spite of these policies, the women, as members, had the loans in their name, and would be responsible for carrying interest and repayments to microcredit meetings. Bijola [Fakirhat, 13], for example, was a widow looking after her grandchildren, and paying off a loan her son had taken out in her name. She said,

> *I am member of Grameen Bank. I took loan from there. Actually not me, but my son took the loan in my name and after he left to India, the responsibility for paying the instalments came to me…. A lot of money. It's about 80 thousands taka…. It's about to be paid but not fully.*

The use of loans was also further perpetuating gendered inequalities. The majority of families with loans were using this money to maintain established farming practices – such as shrimp farming – that falls largely within the domain of men. In some cases, this was a requirement of the loan, with some microcredit organisations offering loans specifically for aquaculture. When asked if she would like to invest the loan in an enterprise of her own, Munazza [Fakirhat, 2] argued that she had no interest to spend the loan on herself, and would rather invest in the family farm. This, however, was followed by the question, *"what would I do*?". Nilima [Fakirhat, 3] similarly said that she had no interest, but also no ability, to spend the money on her own, and would rather spend this on the family. This suggests that perhaps women were engaging in microcredit within the constraints of a patriarchal bargain, or their commitment to affiliation, rather than autonomy. However, it could also be argued that that the benefits usually anticipated from the expansion of women's economic capabilities, were curtailed by patriarchal attitudes that had distorted the delivery and organisation of

microcredit. Women's ability to create new opportunities was curtailed by an ongoing lack of capabilities, including support, resources, and a broader enabling environment.

Microcredit also emerged as a potential maladaptation, with some poorer families unwilling to engage in microcredit and self-excluding, fearing high interest rates, financial risk and stress. Such findings support work from McIntyre et al. (2011). Families needed to demonstrate that they have some savings, or a major asset such as a house, to qualify [Khulna, 19], likely excluding those very poor and landless families and individuals, further entrenching economic disadvantage. For one family in Hurka, neighbours reported that their inability to pay back a microcredit loan had triggered their migration to India [Hurka, 7]. Ponni in Fakirhat [5] had been employed as a field staff member for the government's '*Ektee Bari Ektee Khamar*' (EBEK)[16] Project, which distributed microcredit loans at better rates than local NGOs. Despite being a field staff member, her family had not sought out a loan under the program, as they felt they would not be able to pay it back.

Embankments

Embankments, as discussed in Chapter Four, occupy a contradictory role in the political ecology of Southwest Bangladesh. Permanent embankments, established since the 1960s, were initially designed as flood mitigation and salinity protection, to keep people safe and extend cropping areas (Brammer, 2017; Pouliotte et al., 2009). However, embankments and polders have had significant and often negative consequences in terms of river health, salinity, and flooding. This was reported by community members, as well as academics, government officials and institutional representatives. As outlined in Chapter Four, there is significant evidence and literature arguing that embankments and polders have served the opposite purpose of what they were intended, resulting in raised river beds, which increased flooding and salinity. Ultimately, a top-down, infrastructure-led and often foreign-actor-led approach to water issues in the Southwest has overlooked existing processes of water management (Lewis, 2011), and respond to the immediate manifestations of hydrological change, rather than addressing underlying causes. As one academic argued, embankments as climate change adaptation would offer only "*pseudo-security*" [Khulna, 5]. One government

[16] 'One House One Farm' Project

official argued that while he felt that polders were *"against nature"*, the government were still planning on raising embankments [Khulna, 3]. Despite these findings, the BCCSAP includes the building and repairing of embankments, with significant amounts of adaptation funding directed to this end.

In Hurka, in a rare example of collective action and advocacy, the community was campaigning against the expansion of the shrimp industry, and was pursing the building of an embankment to mitigate against salinity. The community said that an embankment had been built some years prior, which had helped to encourage a return to rice growing in the area, but this embankment had been destroyed by the Aila cyclone. Many felt that a new embankment, along a nearby river was needed. This would allow of salinity to reduce, and allow the community to return to growing crops and vegetables. As one participant at the Hurka DMC described,

> *If we want to get rid of salinity here, there is no alternative to a WAPDA[17] embankment and we made movements accordingly.*

While another participant said,

> *What we have witnessed in Aila and Sidr is that our region is submerged due to tidal surge, so we need a high embankment…. A high embankment is more necessary than any other need.*

Men in Hurka [Hurka FGD 1] reported that, with the help of the local government, and local NGOs, they had written to the Government Water Development Board (WDB) regarding the construction of an embankment, to allow for the inflow of fresh water, but stop salty flows. Subsequent petitions and protest, including a human chain, had been successful, and the government had committed to building an embankment. As Tuhin [Hurka, 3] described,

> *The saline water becomes a health hazard….We want change. We made a procession with the OFDA[18] and went to Khulna. We struggled there for our rights. The prime minister passed and sanctioned our demands in ECNEC[19].*

[17] Water and Power Development Authority, now known as the Water Development Board.

Government works on the embankment had begun near the village, however after an oil spill in the Sundurbans forest, workers were re-directed to re-excavate an alternative shipping route [Hurka DMC]. Construction of a road to the Rampal power plant, via the Hurka village, had further halted work on the embankment. The Rampal Project is an example of the limits in community political organisations, decision-making and advocacy. In the face of large-scale, top-down, capital developments which affect communities' livelihoods and ecological resource base, the community felt powerless.

Embankments run the risk of resulting as maladaptation. Embankments were often found to be an underlying cause of environmental degradation, particularly given the top-down nature with which many embankments have been developed. The Flood Action Plan, for example, is one such example of a top down and foreign aid-driven water management policy, which resulted in a range of negative consequences. In Chitolmari, an embankment had successfully protected the village from salinity for the past 15 years, when the sluice gate had been closed [Chitolmari FGD 2]. However, this embankment was now serving to cut the community off from flowing water for irrigation. Despite these moves for an embankment to protect the village, the community in Hurka was aware of the potential risks, as this conversation demonstrated,

> *Researcher: Apart from embankment are there any other options that you have or dealing with salinity?*
>
> *Vipan: No. There is no alternative other than embankment.*
>
> *Tabari: Though there are demerits to an embankment. Like, the natural flow of water will decrease.*

Others felt that embankments had been an underlying cause of salinity in the area. As Jaina [Hurka, 12] described,

> *Water stagnation, building embankments, decreasing the depth of the canal are numerous reasons for salinity.*

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[18] Office of US Foreign Disaster Assistance, a branch of USAID.

[19] National Economic Council, which approved funding for major developments.

National policy and policy makers have also expressed contradictory views, some of which deny or ignore the negative implications of embankment policies and projects. The BCCSAP includes a thematic area on 'Infrastructure', with much attention given to the maintenance of polders and embankments, as well as the construction of new embankments and polders. To date, much of the funding distributed via the Bangladesh Climate Change Trust Fund (BRTF) has gone to coastal infrastructure, including embankments (Parvin & Johnson, 2015). In Paris, Environment Minister Mr. Anwar Hossain Manju argued for the repairing and raising of established embankments built in the 1960s. However, Chairman of the Parliamentary Standing Committee on Environment and Forests, Dr Hassan Mahmood, also stated in Paris, that "In Bangladesh, back in the 1960s, the understanding was that you have to prevent the flood, and today, we don't want to prevent the flood, because you cannot prevent the flood, we want to live with flood, so we have changed our strategy" (Bangladesh Government Delegation, 2015). Ongoing evidence of makeshift embankments or the destruction of embankments by local communities for local needs, is indicative of the top-down nature of much water management policy.

Shrimp Farming: The Blue Revolution as Adaptation

Shrimp farming in the Southwest has similarly been implemented in a top-down manner, largely driven by political leaders and large landowners, in the pursuit of export income. As outlined in Chapters Four and Five, there is significant evidence regarding the negative social, environmental and political implications of shrimp farming. However, there was some evidence that shrimp farming was being repackaged as a climate change adaptation initiative by some NGOs and government departments. As one NGO representative described, in the areas where salinity is high "*the adaptation is shrimp*!" [Khulna, 22]. Such moves reflect a commitment to ongoing processes of commodification of subsistence (Bernstein, 2010) as well as ecological modernisation as a tool for adaptation (Ahmed & Cokinos, 2017). Shrimp-as-adaptation would allow for ongoing livelihoods in communities exposed to salinity via rising sea levels and storms, but opens the risk of maladaptation. In Hurka, for example, the community had shifted entirely to aquaculture, but not of their choosing, making shrimp farming less of an adaptation, and more a coping tool. As Tuhin, [Hurka, 3], a well-off farmer and land owner described,

> *The salinity was not here before the blockage and we could easily grow rice. Suddenly these changes have taken place. Now there are fish but no rice. We have nothing to do but to adapt because whatever the situation is, we need to live, send our children to school. Once upon a time people hated selling fish. But now, as there is no production of rice, they are taking up fish farming as their livelihood strategy and they are also selling fish in the market… In this area, rice will not grow again because of salinity….so, we could do nothing but adapt with the changes.*

As discussed in Chapters Four and Five, shrimp farming has been linked to exploitative land deals, declining grazing land and waterlogging, as well as some suggestion that shrimp farming is leading to enduring salinity, although this is debated. Many farmers, including in Hurka, Baintola and Fakirhat, reported the declining economic case for shrimp farming, with declining prices at the market, and the rising cost of inputs, alongside the ongoing pressures of disease. Monocultures created in areas such as Hurka, where no other crops are viable, reduce families' capacity to diversify and manage risk. The loss of tree cover associated with shrimp farming, as found in Hurka, and reported in Fakirhat and Baintola, also leaves communities exposed to natural disasters, despite the government acknowledging the importance of mangrove forests and greenbelts. Shrimp farming may also serve to entrench enduring salinity in affected areas, with some evidence that community efforts to reinstate crop based agriculture have seen reductions in salinity over time (Paprocki & Cons, 2014). In addition, similar gendered divisions as those found in relation to field agriculture were found around shrimp farming. Women were engaged when economically required, but without associated benefits in terms of income, entitlements or capabilities. As such, shrimp farming may stand in contrast to socially just or sustainable approaches to adaptation.

Disaster Management Responses

Response to the two major cyclones in the past decade revealed a patchy and uncoordinated system, and further evidence of a poor governance system undermining capacity for adaptation. In the wake of the cyclones, some people reported receiving government or NGO support. Chitta [Hurka, 6] and Saranya [Hurka, 5] were given NGO and government funding to rebuild their homes. Others reported receiving food and small grants of money from local NGOs and the government [Hurka, 12]. Bijola [Fakirhat, 13] reported receiving some

government money to rebuild her house. One departmental representative [Khulna, 4] reported that after the cyclones, there was a huge flow of foreign aid, which was poorly utilised. Organisations such as USAID, the European Commission, the Food and Agriculture Organisation and Oxfam gave families cows, goats, chickens, to affected families, but the success of these schemes are not known, as there was also a limited supply of animal feed.

Local governments are responsible for establishing Disaster Management Committees (DMCs), tasked with monitoring for disasters, managing warning systems, gathering information to be shared with other levels of government and distributing resources. However, the DMCs in the case study areas were not functioning effectively [Khulna, 24],

> *Researcher: And with the DMC, how often is it meeting?*
>
> *Local Government Official: When there is a disaster, whenever there is a disaster, cyclone or whatever, earthquake, if we get any, you know, signal or something, at that time we just call a meeting and sit together.*
>
> *Researcher: Is there anything happening in the meantime, in between? Is there, like any meetings that are happening to kind of monitor the situation, and help people prepare in the meantime, or is it just around disasters?*
>
> *Local Government Official: Actually, we should sit together, like, when there is no disaster, something like that, to just, making them like aware or something, but, as a matter of fact we don't really sit together, except at the time of disasters.*

Co-ordination of information gathering and sharing was also limited,

> *Researcher: And are you getting information from the Union level, are the unions feeding information to you about the environment, and what is going on?*
>
> *Local Government Official: No.*

Discussions with local government officials at the sub-district level [Fakirhat, 16; Chitolmari, 6; Fakirhat, 15] also established that the DMCs were not functioning, or were only functional and resourced in the aftermath of a disaster – not before.

The exception was in Hurka, where a local NGO had established an informal DMC at the ward level, with the intention of feeding information up to the sub-district level. The Hurka DMC included both men and women, and was actively meeting, gathering information and developing plans. Provisions were in place to provide transport for ill people and pregnant women in the case of disasters. The DMC has also administered training for women on conserving food and protecting important documents. In terms of vulnerability, members stressed the risks to women, children, and people who are elderly or sick. While there were cyclone shelters nearby, people talked about expanding the capacity, and ensuring separate spaces and bathrooms for men and women. Throughout the group, salinity was highlighted as the key current challenge, with an embankment highlighted as the only solution. In this DMC, a gender-sensitive, and perhaps gender-transformative approach was being implemented, developing plans that acknowledge the roles, responsibilities and vulnerabilities of women, while giving both men and women a platform to voice their concerns. Observation of the group indicated that participatory exclusion (Agrawal, 2001) has been overcome to some extent through the presence of the NGO and the implementation of local structures that helped to elevate women's participation (see Agrawal, 2001 on enhancing participation). The Hukra DMC indicates the potential of collective action as a key process for adaptation and resilience.

Women's Agency in the Context of Adaptation

The above discussion demonstrates that entrenched gender relations are barriers to gender-transformative change with many initiatives aligning with established gendered power relations. The engagement of women in the majority of adaptation initiatives observed aligned with a gender-sensitive approach, with opportunities for micro-enterprise and micro-adaptations within the household domain. Women's engagement in field work tended to only occur when there was an economic necessity, and was not leading to improvements in women's entitlements, capabilities, or more equitable gendered divisions of labour and decision-making.

Socially just and sustainable adaptation requires specific attention and consideration of the agency of women themselves. Failure to do so risks maladaptation, and follows enduring patterns of paternalism by governments and NGOs in development settings. As such,

understanding adaptation efforts requires an examination of agency, acknowledging that there are negotiations that go on between well-being and resilience (Coulthard, 2012), that can lead women to suffer. While much development and empowerment literature commonly attributes agency only to those actors who take up initiatives outside of established societal structures, Rashid (2013) and Mahmood (2005) have sought to conceptualise agency in a way that does not presume western, liberal conceptions of autonomy, resistance and emancipation. Mahmood argues that agency should be understood, not as a synonym for "resistance to relations of domination but as a capacity for action that historically specific relations of *subordination* enable and create" (Mahmood, 2005: 18, original emphasis).

Affiliation remained a key goal. Women themselves acknowledged and valued the contributions they make, and want to make, to family income and food security, and in adaptation processes. As discussed, many women were able to make some contribution via homestead gardening, in particular the raising of ducks, chickens and cows for eggs and milk. Many women were using these products in cooking, as well as selling eggs and milk to nearby markets, or people who passed through the village. Many women said that their family would not be able to survive without their contributions, considering the income and resources they gathered as essential. Nisha [Baintola, 9] and her family, lived on a land only big enough for their house, and had no land for farming. Her husband bought bananas from the neighbours, and sold them at the markets in an adjacent district, where no bananas grow due to salinity. Nisha raised ducks and cows at home. When asked if her family would survive without her contribution to food and income, Nisha said,

> *No. We couldn't survive without the hens and cows, we need this to survive – but it is still not enough. The work that women do is important, both husband and wife and children are working.*

There was also a widespread view that women were active as earners outside their homes, even when this did not align with local realities. Many women and men argued that women were free to work outside of the home, and in discussions around changes in key social norms over the past 30 years, people felt that women's ability to work outside of the home and village had improved. People referred in particular to improvements in education, and successful government policies to encourage enrolment of girls in primary school. In Fakirhat [Fakirhat FGD 2] women discussed how improvements in income as a result of shrimp

farming had improved the scope for girl's education. Most women talked about education for their children, both boys and girls, as a key goal.

When asked if these changes in women's employment extended to their own family, or to themselves, most participants said no. For women, their perceptions on their ability to work outside of the home was more closely linked to their home and family requirements, in particular, caring for children. Only a few people explicitly attributed this to Muslim or Hindu religious requirements, with others referring more broadly to tradition. Nipa [Baintola, 17], who was doing both home and field work on her family's farm, said,

> *We can't totally follow the rules of our religion, even if our husbands don't want us to go against religion and work outside…. I think this [women working] is good because it helps my family…. No-one speaks ill of me and if I don't work, then how shall I support my children?... The fact is, I can share the work and that's why we have solvency.*

In Chitolmari, a group of men [Chitolmari, 1] said that while Muslim women couldn't work in the fields, Hindu women could, although this did not stand up in following interviews a focus groups – Muslim women were engaged in farm work in Chitolmari, and the other case study villages. The garments industry, a major driver of economic growth and women's employment in Bangladesh, has not reached the Southwest. In Chitolmari, we met one women, Muni, who had worked in the garments sector in Dhaka, and she had helped some younger women from the village also get work in the sector. However, this did not extend to any of the other villages.

However, there was evidence that where there was economic imperative, women's roles expanded to include work outside of the home. This was occurring within the context of women's commitment to affiliation, with women seeking to support their families. This suggests that the expectations placed on women are elastic depending on material conditions. However, this does suggest women engaging in a 'patriarchal bargain' to their own detriment, with the risk of women's double burden. In addition, the expectation that women's expanded economic capabilities would lead to increased agency were not realised, with these new roles not leading to improvements in income or ownership of land. New forms of labour itself is not enough.

As discussed in Chapter Six, with regards to poverty, women and men acknowledged that even if they did want to work, the opportunities in the region were limited. While there was limited evidence of many women engaging in work outside of their villages, these changing perceptions give an indication that underlying attitudes that underpin structural barriers to women's engagement in off-farm work may be changing. Women also talked about wanting more opportunities for work at home, or in their villages, with opportunities considered appropriate for women, suggesting a desire for gender-sensitive adaptation initiatives. As Nisha [Baintola, 9] said,

> *We want separate work…for men and women...factories, handicrafts. Everyone wants this, we [women] can't earn money from outside.*

Sana in Fakirhat [11] suggested the establishment of a factory nearby the village, so women could still fulfil their home tasks – she suggested that the government set aside land for companies willing to establish enterprises.

Women and men also situated their wellbeing and responsibilities firmly within the context of the family, supporting Kabeer's (2011) arguments regarding the importance of affiliation. Women's contributions to adaptation processes were seen more as an effort to contribute to their families, rather than a reaction to environmental changes – agency was enacted in everyday and personal ways, rather than collectively or strategically (see Coulthard, 2012). In the case of microcredit, women felt that despite not having control of the credit, this was an opportunity for them to contribute to their family. In terms of vulnerability, interviews included questions about the challenges that women were facing in the context of environmental change. Both women and men stressed the difficulty in separating out impacts, challenges and contributions by gender. People argued that families consist of both men and women, who feel the impacts as a whole, and if situations change, then everyone would be affected [Fakirhat FGD 2]. This suggests that conceptions of 'resilience' and 'vulnerability' were seen more in the context of 'family resilience' and 'family vulnerability'. Indeed, intersections with class and geography – issues that families would be dealing with together – have a significant impact on vulnerability and adaptation options. However, a conceptualisation of adaptation as a family based issue is indicative of the wider discourse regarding resilience as the responsibility of families, rather than communities, regions, or authorities.

Summary and Discussion

This chapter examined a range of adaptation initiatives observed in the case study communities, looking at the ways in which these initiatives interact with underlying causes of vulnerability, including gender inequality, poverty, local environmental issues, and governance. The initiatives observed were primarily working to meet the practical needs of families, and often failed address the key underlying causes of vulnerability identified in Chapters Five and Six – environmental exposure as a result of local political interventions, poor governance, limited knowledge and entrenched gender relations. Adaptation initiatives were firmly situated within established social environments and were often re-enforcing established divisions of labour and local level power structures. The capacity for transformative adaptation was further undermined by a weak governance environment.

Poor governance around adaptation was serving as a barrier to meaningful change. The BCCSAP was not understood or utilised at the local level, in part due to not being translated into Bangla. Institutional representatives and NGOs held predominantly small-scale, community-focused notions around what adaption is, and how it should be implemented, reducing the capacity for regional or collective approaches. The gendered implications of climate change were not being well considered, and a "virtuous and vulnerable" (Arora-Jonsson, 2011: 745) discourse was being promoted. These failures have left a governance vacuum within which communities are not able to understand, or claim, their rights. This was coupled with a lack of knowledge about climate change and climate policy, as also outlined in Chapter Six.

An overall symptoms-driven approach to adaptation was primarily serving to reproduce existing power structures, undermining the capacity for more in-depth, transformational change. A number of initiatives observed in the field were implemented by local NGOs as part of 'community based adaptation' efforts. This included homestead based work, farm based work, off-farm work, community groups, and one example of collective advocacy. In focusing primarily on individuals and families, many of these initiatives were undermining the capacity for collective action, putting the responsibility for resilience back onto affected communities. Such findings echo Tierney's (2015) conceptualisation of the 'neoliberalisation' of resilience, whereby vulnerable communities are also responsible for

addressing environmental hazards. Shrimp farming, embankments and the use of adaptive seeds can broadly be categories as symptoms-driven, and extending existing processes of "commodification of subsistence" (Bernstein, 2010: 49) in Southwest Bangladesh, drawing farmers into export-focused production that many be ultimately further undermining their natural environment. These initiatives could also be seen as examples of maladaptation, opening risks for further environmental degradation.

Many of these initiatives had the express intention of strengthening family income, taking a development approach to adaptation which overlooks the ways in which conventional development work has created social inequalities and vulnerabilities (Cannon & Müller-Mahn, 2010; Grist, 2008). Microcredit initiatives, for example, were found to be tying families into cycles of debt. The handicraft initiative in Baintola had left women exploited and overworked. The sunflower initiative in Chitolmari was making modest improvements to family income and food security, while the community continued to struggle to gain access to fresh water and electricity. Poultry farming was similarly making modest improvements to family income, and allowed families to utilise limited space in novel ways, but was doing little to address underlying constraints in terms of access to clean water. In being largely symptoms driven, these initiatives were not focused on deeper questions around the social causes of vulnerability, and were at times leaving people in more precarious conditions.

Gendered divisions of power and labour were being reproduced via adaptation initiatives. Home-based initiatives were found to be broadly 'gender sensitive' (CARE International, 2010) aligning with existing power structures to meet women's practical needs (FAO, 2012), with women pursuing home-based activities that align with their sense of identity as caregivers, and men pursuing productive, field-based initiatives. Women were still primarily engaged in homestead activities – cooking, collecting water, caring for family members – but adaptation activities were opening the scope of what was available to them in this home setting, engaging in handicrafts and egg and milk production for income. Women were also expanding the use of home-based resources, such as ponds, as well as finding ways to engage with the commons to feed animals. Women's capacity to pursue adaptation at home is based on the social, cultural, and at times religious expectation that women stay at home. Women were able fully inhabit their role as home caretaker, satisfying the expectations of themselves and their husbands, but find niches in which they saw themselves as integral contributors.

These new, home-based roles for women capture the 'caretaker' discourse regarding women and adaptation (Resurrección, 2011), and may represent a further burden on women.

Outside the home, men, as well as women, were actively engaged in adaptation processes, including diversified off-farm work, installing new cropping patterns, and working with adaptive crops. However, the flexibility and "elasticity of women's labour" (Moser, 1989: 1814) was highlighted – women were engaged in productive and commercial work when needed, but without concurrent shift in the kinds of tasks men were engaging with. Farm-based work also did not indicate the opening of other opportunities for women, such as land-ownership, mobility, or work outside the villages.

Some initiatives were opening micro-opportunities for transforming gendered power relations. Women themselves were eager, and able, to contribute to their families' food security and livelihoods, and mindful of the broader, systemic limitations they faced. In Chitolmari, despite being initially excluded, women had gained new skills in sunflower farming, and the community had been able to continue this work independently of the NGO that had launched the project. Women's perception of their positive contribution to the family income and food security represents a change consistent with broader gender and labour changes happening in Bangladesh. However, women also stressed the limited earning opportunities available in the region, even if they were willing to work outside of the home.

The following chapter, Chapter Eight, draws together the key findings from Chapters Five, Six and Seven, and sets these findings within the established literature regarding environmental change, vulnerability and climate change adaptation.

Chapter Eight: Discussion and Conclusion

Introduction

Bangladesh sits at the heart of global discussions and debates regarding climate change. In a natural disaster-prone region, and as a country that has experienced some of the worst of colonization, conflict and global inequality, the lives, livelihoods and wellbeing of the 10 million people in coastal Bangladesh is of major concern to governments, NGOs and researchers. Moving from this macro perspective, environmental sociology and political ecology invite us to look at the local level, where inequality and vulnerability emerge along geography, class and gender lines. For feminist researchers, there is a challenge in exploring the specific vulnerabilities faced by poor women in the face of climate change, while being mindful of these women's agency and ability, and recognising the manifold ways in which gender and gender inequality is expressed, altered and stretched through everyday activities and in interactions with changing environments. The women interviewed in Bagerhat are not static victims, but dynamic agents looking to fulfil their identities and responsibilities in often trying conditions.

In this thesis I have explored the gendered and social implications of climate change adaptation in Southwest Bangladesh, drawing on feminist conceptualisations of vulnerability, adaptive capacity vulnerability theory and transformative adaptation theory. I have aimed to respond to a number of gaps in sociological and development literature regarding climate change and gendered vulnerabilities. Firstly, there has been little empirical work, beyond project evaluations, investigating the effectiveness of community climate change adaptation initiatives, in terms of their capacity to effect meaningful social change. Secondly, there has been little work examining the gendered nature of adaptation, and much gender and climate literature has been criticised for static representations of women, requiring more sensitive theoretical approaches. Thirdly, understanding of the underlying causes of environmental changes has been lacking in much of the adaptive capacity literature, calling for sociological re-engagements with the environment as a key factor in social phenomena.

Drawing on these insights, I have explored the following research questions, presented in Chapter One:

- What environmental changes are taking place in Southwest Bangladesh, and what are the underlying causes? In what ways are communities exposed and sensitive to these environmental changes?
- How do social, political and economic inequalities shape the experiences of environmental change in Southwest Bangladesh?
- How do adaptation initiatives interact with the underlying causes of vulnerability, and how is power and agency expressed in adaptation practices?

These questions were guided by adaptive capacity vulnerability theory (Preston & Stafford-Smith, 2009), as presented in Chapter Two, which conceptualises community experiences of environmental change as a combination of external exposure, internal sensitivity and adaptive capacity. Within this, I have focused on gender as a key factor influencing sensitivity and adaptive capacity. I have conceptualised gender as mutable and emerging in part from interactions with environments, geographies and resources, within broader political and cultural settings. I have drawn upon Allen and Sachs' (2007) gender and food framework to examine the multiple and variable ways in which women engage with agricultural environments and the ways in which this links to gender, agency and identity. I have also drawn on insights from Adger et al. (2009) and Carr (2008a) to understand the ways in which adaptation initiatives respond to, and exist within, existing environmental, social and political settings.

In order to explore the above research questions, I used a qualitative, participatory, case study approach in Bagerhat, Bangladesh, informed by critical realism and feminist political ecology, as outlined in Chapter Three. Critical realism in particular, encourages the investigation of underlying mechanisms that can be used to explain social phenomena, and assisted in examining mechanism underlying the manifestations of vulnerability. In addition, this methodology allowed for a more 'ecosociologcial' (Stevens, 2012) approach, that acknowledges embodiment, experience, and the power and role of environments in societies. Using interviews and focus groups, I spoke with people living in four villages in the Bagerhat region of Bangladesh, discussing their village history, their livelihoods and hopes for the future. While limited in terms of being truly participatory (examined in more detail below), this methodology allowed for an explicit focus on the experiences of women, and an understanding of the ways in which gender and class are created in part through interactions with environments.

The following section outlines the findings to these research questions and their significance for theory and practice. There are four key findings:

1. Firstly, I argue that the environmental exposure of the case study communities lies in a political context that has triggered environmental degradation, magnified by climate change. Much environmental change in Southwest Bangladesh is the result of government policies and interventions designed to commodify agriculture and agricultural landscapes, with climate change exacerbating these locally-bound issues. As such, adaptation responses need to engage with the political economy and ecology of agriculture in the Southwest. This study contributes to understandings of environmental change in Southwest Bangladesh by highlighting the need to contextualise climate and environmental change, and as such, ground adaptation responses in local and regional contexts.
2. Secondly, gender inequality, livelihoods, poverty and limits in knowledge were contributing to vulnerability and limiting community capacity to respond to environmental challenges. Women faced particular challenges, as a result of macro- as well as intra-household social, economic and political relations, which valued the work, decision-making capacity and material position held by men. While women's work was found to span the socio-cultural and material domains, women's entitlements were often confined to the home, constraining their capacity for adaptation. This study contributes to gender and climate literature by providing an examination of gender and vulnerability that seeks to overcome the static and generalising approaches to women evident in much of the literature.
3. Thirdly, I argue that adaptation initiatives that communities were pursuing were following a neoliberal and symptoms-driven approach. Adaptation initiatives were re-producing existing gendered power relations, while allowing governments and NGOs to shift responsibility to affected communities, by de-politicising and de-contextualising environmental change. These initiatives were failing to address, or at times working to re-inforce, the underlying causes of vulnerability.
4. Finally, these findings suggest the need for a model of adaptation as 'transformation', that can address the underlying structural issues identified. There is a need to go beyond small-scale initiatives which focus on manifestations at the expense of underlying mechanisms. Drawing from the research findings, I outline possibilities

for adaptation policy, practice and research that are informed by feminist theory, gender justice and social justice.

After discussing these findings, I go on to explore the limitations of this research, including methodology and ethical research practice, and implications and suggestions for future research.

Environmental Changes and Community Experiences

This first section sets out the conceptualisation of vulnerability used in this thesis, expanding on the work of Preston and Stafford-Smith (2009). Interlinked vulnerability determinants, including external exposure, internal sensitivity and adaptive capacity, create differing and unequal experiences of environmental change within and between communities. A key contribution of this thesis is the application of the adaptive capacity vulnerability framework in the context of adaptation in Southwest Bangladesh, building on empirical work by Pouliotte et al. (2009), Wright et al. (2012) and others. In addition, my inclusion of a feminist political ecology framework and a critical realist ontology examines what Sultana (2014: 3) describes as "the complex ways that gender–environment relations are produced, performed, contested, and lived". This combined framework acknowledges that environmental changes are experienced in the context of other social, political and economic conditions (Pouliotte et al., 2009) to which adaptation needs to respond. These factors represent the underlying 'mechanisms' that create vulnerability for the case study communities. This framework also highlights that a transformative approach to adaptation is required, to work towards these roots level mechanisms, and offers a novel approach to understanding the interactions between vulnerability and adaptation.

The application of this framework to the case study communities, as presented in Chapters Five and Six, reveals that the communities were facing a range of environmental changes, which in turn were impacting on livelihoods and wellbeing, with men and women experiencing unequal impacts. Pre-existing configurations of power, including poverty, gender inequality and gaps in knowledge and governance, were constraining the capacity of communities to respond in sustainable and just ways.

The key vulnerability determinants are presented in Table 8.1 and discussed below. Vulnerability is analysed here in terms of key vulnerability determinants, contextualised with regards to the case study communities in terms of the manifestations and outcomes observed and discussed in the communities, and the underlying mechanisms creating these manifestations. Such an approach to vulnerability analysis directs attention towards underlying social relations that could be addressed by transformative adaptation approaches.

Table 8.1: Vulnerability Determinants across the Case Study Communities

Vulnerability Determinants	**External Exposure** *Risk and experience of environmental and climate hazards*	**Internal Sensitivity** *Impact to lives, livelihoods and wellbeing*	**Adaptive Capacity** *Command of a range of entitlements to respond to exposure and sensitivity*
Manifestations	• Exposure to salinity, waterlogging, climate changes and storms	• Degraded food and water security • Multidimensional poverty • Increased workloads for women	• Multidimensional poverty • Gender inequality • Limited knowledge
Mechanisms	• Global carbon emissions • Local environmental changes • Historical agricultural interventions • Regional politics	• Reliance on natural resources in degraded environments • Limited agricultural livelihoods • Gendered divisions of labour	• Gendered roles, relations, capabilities and entitlements • Restructuring of agricultural livelihoods • Failures in education and governance

Source: Compiled by author from interviews and focus groups

Exposure and Sensitivity at the Intersections of Global and Local Economies

While a number of studies have utilised the adaptive capacity vulnerability framework to examine communities affected by climate change (see Cinner et al., 2015; Pouliotte et al., 2009; Shackleton et al. 2015), many of these studies focus primarily on intrinsic social factors within affected communities, with less consideration on extrinsic and environmental factors.

However, there is a need to examine the nature of environmental risks, including the underlying causes, outcomes, and interactions with social and political forces. These insights guide the path for meaningful, transformative adaptation responses which seek to understand and address the mechanisms that create environmental and social vulnerabilities. Without such analysis, responses run the risk of being symptoms-driven, decontextualised and managerial, with outcomes that are at best ineffective and at worse, maladaptive, as was occurring in the case study communities.

As discussed in Chapter Five, the environmental challenges facing the case study communities could be traced to a number of underlying mechanisms, with causes rooted in local and regional politics. The environmental challenges facing the region were not the benign or apolitical results of natural environmental variations. Rather, they were the outcome of global economic restructuring manifested through domestic and regional policies, in combination with climate change, with vulnerability emerging at the intersections of livelihoods, class and geography. Communities were exposed not only because of their proximity to a coastline accustomed to storms and cyclones, but also as a result of agricultural policies and interventions that have focused specifically on the Southwest region as a site of export-driven agrarian change. The "commodification of subsistence" (Bernstein, 2010: 49) had drawn communities into export-driven modes of production, re-shaping livelihoods, landscapes and agrarian relationships. This included the introduction of poldering, for-export shrimp and aquaculture, and the introduction of high-yielding and modified crops requiring fertilisers and pesticides. Regional politics, in particular Bangladesh' relationship with India, were also having severe outcomes for local communities and ecologies. Hurka in particular, having been impacted significantly by the Farakka Barrage, was also facing the impacts of the Rampal coal-fired power plant, as the Indian and Bangladesh governments pursued an environmentally harmful industrial, energy and economic policy.

Livelihoods based on agriculture and an ongoing reliance on natural resources had left these communities sensitive to the impacts of these changes. The communities were all engaged in agricultural livelihoods that had been affected by modernisation, commodification and export-oriented policies. Across the field sites, those families with ongoing reliance on agriculture and natural resources were facing declining agricultural terms of trade, seasonal hunger and water insecurity.

On top of these challenges was the risk and impact of climate change. While communities were largely not aware of the causes or projections associated with climate change, they were aware of changes in broad weather patterns, and were already feeling the impacts. There was evidence of changing rainfall patterns, changing seasonality and increasing temperatures. There were reports of untimely rainfall impacting on agricultural production. The communities had also experienced the impacts of recent cyclones and storm surges, and while not caused directly by climate change, are indicative of the future stresses these communities could face. This is particularly concerning given the evidence of seasonal hunger and water stress. In addition, climate changes were exacerbating pre-existing environmental challenges, acting as a 'magnifying glass' for these existing local issues, with producing environmental challenges that cannot be addressed at the village level alone. This included the links between existing salinity and sea level rise, and the impacts of water stress. However, there was a tendency among government agencies and NGOs to decontextualise, and 'depoliticise' (Paprocki, 2015) the environmental changes taking place in the Southwest by focusing on climate change as an external, global issue, without recognising the local interactions leading to vulnerability. In failing to take local environmental contexts into account, a number of adaptation responses observed could be seen as examples of 'maladaptation', as discussed further below.

Gendered Vulnerabilities

The environmental vulnerabilities outlined above sit within a social and political context that was shaping people's experiences of climate and environmental change. In exploring the social nature of vulnerability, I sought to critically respond to a wide body of literature outlined in Chapter Two, highlighting the challenges faced by women in particular. Much literature has argued that women are more vulnerable than men to environmental degradation and climate change, due to gendered inequalities that limit women's mobility, access to resources, and put them in close contact and reliance on natural resources (see Alston, 2015; Cannon, 2002; Demetriades & Esplen, 2010; Lahiri-Dutt, 2012). In response, much development literature and practice has situated women as central to environmental struggles, in order to address women's heightened vulnerability and to privilege women's voices, knowledge and leadership. The result, however, has often been static representations of women as victims who are also responsible for the wellbeing of their communities (Arora-

Jonsson, 2011; Resurrección, 2011). As such, there is a need to focus on the underlying drivers of gender vulnerability in order to craft responses that address gender and social inequality (Resurrección, 2011). In responding to these critiques, Chapter Six examined the role gendered inequalities play in mediating experiences of environmental change, exploring gendered relations, institutional settings, women's agency and intersections with marital status and poverty. In keeping with Sultana (2009), I have conceptualised gender as a social, spatial and ecological process (Sultana, 2009), arguing that gender roles and relations are "dynamic and context-specific" (Dankelman, 2010: 10), influenced by historical and political processes (Momsen, 2010). I drew on Allen and Sachs' (2007) gendered food framework, in concert with the concepts of entitlements and capabilities, whereby intra-household distributions provide more detailed understandings of vulnerability around food (Pritchard et al. 2013). These theoretical guides helped to overcome the view of women's vulnerability as essential and static, and directed examinations towards local-level relations within broader political economic contexts.

As discussed in Chapter Six, the vulnerability of women to climate and environmental change in the case study communities was found to lie in macro- as well as intra-household social, economic and political relations, which value the work, decision-making capacity and material position of men. Women's experiences of environmental change were rooted in gendered expectations around labour, as well as limited entitlements and capabilities, mediated by class and marital status.

Women's roles and responsibilities, particularly socio-cultural work around water, household work and caring work, were putting women in direct and regular contact with degraded environmental resources, on which they relied for family wellbeing, but also for their own agency and identity. In terms of natural disasters and fast-onset changes, women confirmed the challenges associated with accessing shelter and safety, constrained in part by their responsibility to look after family members, but also by a lack of accessible shelters and limited disaster response processes at the local government level. The limited availability of fresh water in each of the villages directly impacted on women's role as provider and caregiver. As water resources were becoming increasingly degraded, women were investing more time in collecting water, and making judgements around the quality of water for use for drinking and watering homestead gardens. Men's roles and identities were also affected by the availability of water, but more so water used for crops and irrigation, and men often

maintained a reliance on saline water for aquacultural production. Fluctuations in salinity were therefore having contradictory impacts on men and women. In addition, environmental changes and the introduction of hybrid rice varieties, were putting pressure on women's homestead food production, including pressure on the availability of food for livestock. Women continued to eat last, opening risks to women's own health in order to maintain that of their families, which is of particular concern in light of evidence of seasonal hunger. The socio-cultural domain remains a key focus for gender and climate theorising, not only because of the vulnerability that the socio-cultural domain engenders, but also given that these roles and spaces shape women's identities and agency.

Beyond evidence of a socio-cultural bias, women's work spanned formal, informal and household economies (reflecting Allen & Sachs, 2007), but women were undervalued in comparison to men in these spaces. There remained persistent undervaluing of women's work that constrained opportunities for meaningful adaptation. There was evidence of women's increasing engagement in farm-based work, and a number of tasks that were considered shared. However, the sharing of farming and food production tasks between men and women did not necessarily translate into shifts in gendered roles and expectations or entitlements. Attitudes regarding what was acceptable work for women remained, with farm-based work seen as an exception based on material needs. Farm-based work also did not lead to an expansion of women's economic or social entitlements, reflected in ongoing discrimination in terms of women's ownership of land, access to markets, microcredit processes, or earning sufficient income to make substantial adaptation decisions. Women's visibility in material spaces may be a first step towards breaking down gendered divisions (Hafiza & Neelormi, 2015; Nazneen, 2010), but this was yet to manifest in the case study communities. Roles for older, widowed women, however, extended beyond what was considered acceptable, and these women found some support from their communities to engage in diverse work. Indeed, these women argued that they had no other choice, and as Kabeer (2016) writes, women from poor households are better represented in the work force. Broader economic inequality was also contributing to sensitivity and low adaptive capacity for women. Communities were facing a crisis of employment, driven in part by poor agricultural output and markets, environmental degradation and insufficient social safety nets. Without these social protections, some families had been forced to pursue harmful coping mechanisms, undermining their resources or options for the future, such as single women who had been compelled to arrange early marriages for their daughters or remove children from school.

Overall, there was widespread evidence of women taking on extra work, reflective of women's double burden. Without access to broader support, or improvements in entitlements, women were expanding their material roles and responsibilities, while seeking to maintain existing socio-cultural responsibilities under constrained conditions. The limitations that many women faced in the material domain, was constraining adaptive capacity, limiting opportunities for diversification or innovation for women and their families.

These findings indicate that it is not enough for adaptation to address only poverty, or work at the household level alone – it is the intersections of agricultural policy, poverty, and intra-household relations that create gendered vulnerabilities. Social structures around the distribution of roles and resources, and well as broader structural conditions, need to be addressed in transformative adaptation initiatives. However, as will be discussed below, rather than addressing the "structural dynamics of disaster vulnerability" (Parvin & Johnson, 2015: 898), adaptation initiatives tended to address symptoms, opening the risk of maladaptation and compounding social inequalities.

The Limitations of Adaptation and Risks of Maladaptation

As outlined in Chapters Two and Seven, I have drawn upon Bee's definition of adaptation as "specific actions that individuals or societies take to reduce or minimise the risks posed by a changing climate as well as the broader processes that shape these responses" (Bee, 2014: 4). This situates adaptation within a broader context, acknowledging intrinsic and extrinsic factors drawn out in the adaptive capacity vulnerability framework. However, there has been limited research applying the adaptive capacities framework to understandings adaptation initiatives, in term of their impact and effectiveness, and their capacity to address underlying causes of vulnerability.

As discussed in Chapter Seven, people in the villages were taking part in a range of initiatives that can be broadly classified as 'adaptation', including farm-based, off-farm and homestead activities. The key initiatives that were analysed included the development of a handicraft collective in Baintola, poultry and livestock across the villages, the use of adaptive and modified seeds, sunflower production in Chitolmari, the building of embankments and shrimp farming. In examining these initiatives, and setting these initiatives against the

exposure, sensitivity and adaptive capacity of these communities, I draw a number of conclusions. Firstly, while there was some evidence of re-negotiations of gendered roles via adaptation, most initiatives were re-enforcing established gendered power relations. Reproduction of public/private divides and ongoing limitations in women's capabilities and entitlements resulted in initiatives doing little to address women's underlying vulnerability. Secondly, initiatives reflected an individualisation and neoliberalisation of approaches to resilience, wellbeing and adaptation. Small-scale initiatives were putting responsibility onto individual families, largely working at the 'manifestations' level, and addressing predominantly practical needs. These arguments are expanded below.

Gendered Implications of Adaptation Initiatives

As discussed in Chapters Two and Six, gendered identities and subjectivities were constructed, produced and negotiated, in part, through everyday environmental practices, including divisions of labour, norms and rights regarding water, land and food. As such, changes to environmental, social and political contexts may also lead to re-negotiations of gendered identities (Sultana, 2009) or deepening of gendered inequalities. In the context of environmental change and adaptation, changes observed in gendered divisions of labour were not simply adaptations to new material and environmental conditions, but rather, re-negotiations of gender categories and expectations placed on men and women in particular contexts (Alston & Whittenbury, 2013). Despite some evidence of micro-shifts in gender relations, many of the initiatives observed relied upon established divisions of labour and power, producing and reproducing gender relations in the home and in the fields. Such findings support the work of Djoudi and Bockhaus (2011), Carr (2008a; 2008b) and Bhattarai, Beilin, and Ford (2015), who have begun to flag the ways in which adatpation initiatives can engage women in new roles without associated improvements in rights, capabilities and entitlements. Understanding the persistence of, and underlying mechanisms within adaptation initiatives themselves, offers clues as to opportunities for more transformative, socially just initiatives (Carr, 2008a).

Many of the adaptation initiatives observed were found to be broadly 'gender sensitive' (CARE International, 2010) aligning with existing power structures to meet women's practical needs. Initiatives often perpetuated established gender roles, limiting opportunities

for innovation, transformation or the pursuit of strategic gender needs. The gender focus within microcredit administration, for example, was serving to benefit men and men's work, perpetuating established perceptions around the limited capacity of women as productive members of the community. Without meaningful access to credit that they themselves could control, adaptation options for women were further limited. The sunflower project in Chitolmari focused attention on men, excluding women from training and overlooking local divisions of labour. Handicrafts and poultry-rearing projects were perpetuating women's socio-cultural and home-based work, and in the case of the handicrafts work, had left women exploited and overworked. Handicrafts and poultry-rearing had also contributed little to alleviating poverty. These initiatives were resulting in the perpetuation of the gender relations that were creating vulnerability for women.

Women's own agency had a strong bearing on the adaptation opportunities they were pursuing, both inside and outside of the home. Drawing on Mahmood's (2005) approach to agency, women's capacity to pursue home-based adaptation can be seen as a manifestation of women's own agency, while sitting within social, cultural, and at times religious expectations that women fulfil certain roles. Women were still primarily engaged in homestead activities – cooking, collecting water, caring for children – but adaptation activities were opening the scope of what was available to them in this home setting, engaging in handicrafts and egg and milk production for income. Within the home, women felt that they were able to inhabit their role and identity as home caretaker, satisfying the expectations from themselves and their families, while finding new opportunities to contribute to household income and food security. Women were also expanding the use of home-based resources, such as ponds, as well as finding ways to engage with the commons to feed animals. However, these new, home-based roles for women also capture the 'caretaker' discourse regarding women and adaptation (Resurrección, 2011), and may represent a further burden on women. Women were also mindful of the broader systemic limitations they faced, including barriers to off-farm work, stressing that there were limited earning opportunities available in the region, even if they were willing to work outside of the home. Evidence of participatory exclusion (Sultana, 2009), as a result of social norms, gendered divisions of labour, and special divisions, was evident, in some cases leading to active disempowerment (as with the case of the handicrafts).

Beyond the home, there were micro opportunities for reconfiguring gendered power relations, as both women and men 'inhabited' or 'resisted' (Mahmood, 2005) established gendered norms. For example, men and women were actively engaged in adaptation processes outside of the homestead, including diversified off-farm work, installing new cropping patterns, and working with adaptive crops. The feminisation of on-farm work was an indication of these shifts in gender roles, with women engaging in on-farm and off-farm work when it was necessary for family livelihoods. The most notable example was the sunflower project in Chitolmari. While being gender-normative in its implementation, the outcomes of the project may represent a micro-shift in gendered norms, and an example of inadvertent gender-transformation. Women in Chitolmari were essential to supporting sunflower production, and were filling spaces and roles that men were unable to fulfil, which was particularly important in an area where both men and women felt that it was not the place of women to work outside the home.

However, despite evidence of women actively engaging in work typically considered the domain of men in all of the villages, these new roles were not leading to wider changes in expectations around roles and relations, nor satisfying women's strategic needs. The flexibility and "elasticity of women's labour" (Moser, 1989: 1814) was highlighted, helping to explain the feminisation of agriculture – women were engaged in productive and commercial work when needed, but without concurrent shifts in the kinds of tasks men were engaging with. Farm-based work did not indicate the opening of other opportunities for women, such as land-ownership, mobility, or work outside of the villages. As such, the expectation that women's expanded economic capabilities would lead to increased agency, as Sen (1999) and other have argued, were not realised. New forms of labour were not enough to lead to other expansions in women's capabilities. As Caraway (2006: 424) writes, new material conditions have the capacity to "reproduce gender divisions in a slightly altered form, rather than undermine gender as a bedrock category in labour markets", as was the case here. These findings suggest that while environmental change does open opportunities for shifts in the manifestations of gender, via roles, responsibilities and interactions with environments, these changes occur within the context of established gendered identities, and the agency of men and women in these spaces. New material realities were not enough to engender radically new power structures – rather, micro-changes emerged via negotiations that tended to expand the expectations placed on women, without concurrent expansions in entitlements outside of the socio-cultural domain. Gender roles were recast in a way that

maintained unequal material relations across families. Women themselves sought to maintain their responsibilities and identities using limited and at times diminishing resources, including land, water and food. In order to pursue gender justice, and open access to capabilities and entitlements for women, adaptation may need to function at both micro and macro levels, for example via expanded access to welfare, education and services, in order to circumvent persistent inequalities at the household and local level. Micro-changes also need to be understood within the context of macro-changes and improvements in gendered inequalities occurring in Bangladesh, including the increased access to education, declining birth rates, mobility and early marriage. These macro shifts give important insights into how gendered norms can, and do, change and the opportunities for adaptation initiatives to address these challenges.

Neoliberalisation of Adaptation

The predominant focus on small-scale, family-based initiatives as opposed to collective or regional approaches, suggests an individualisation and "neoliberalisation" of resilience, whereby the responsibility of the state is diminished, and greater emphasis is put on resilient individuals (Tierney, 2015). Tierney (2015: 1333-4) describes this process, whereby, "adaptation on the part of so-called resilient individuals is preferable to collective resistance" and such expectations limit efforts to address the structural deficiencies and underlying mechanisms that have produced vulnerability. As outlined in Chapter Two, collective action is a powerful tool for gender justice, leading to a collective voice, essential for procedural justice, as well as more equitable distribution of resources, sharing of risk, long-term planning and reflection on common concerns (Hafiza & Neelormi, 2015; Kabeer, 2012; Pandofelli et al., 2008).

However, the majority of the initiatives observed were focused on individual farms or homesteads, with a view to improving family income and farm productivity, including the use of adaptive seeds, household livestock and poultry and microcredit for shrimp farming. Many of these initiatives were working at the manifestations level, and were contributing somewhat to practical needs for women and their families. These initiatives were doing little to address the deeper structural mechanisms behind vulnerability, either socially or environmentally, making small scale adjustments to farming that are likely to be

overwhelmed by the anticipated impacts of climate change. Indeed, there are already examples of this – in areas affected by Aila-induced storm surges, salinity levels have outstripped the capacity of salt-tolerant crops (Rabbani et al., 2013; Warner et al., 2012), as was found in Hurka. This suggests that adaptation needs to go beyond responding reactively to environmental changes at the individual family or farm level – a socially just approach requires consideration of the longer term implications of adaptation initiatives, including consideration of the undue responsibilities placed on farmers to adapt to environments degraded by political forces (such as the key mechanisms described in Table 8.1) beyond their control.

This focus on individual families and farms eroded the capacity for more meaningful collective action, or collective sharing of resources, that would be required to address key underlying mechanisms of vulnerability. The handicrafts project, a potential example of collective adaptation, had been coopted by an NGO for commercial gain, exploiting the women involved, rather than addressing gender inequality. The one example of collective political organising, regarding advocacy for an embankment in Hurka, had been slowed by the development of the Rampal power plant, with regional political forces eroding the capacity for local political action. In Chitolmari, the community listed access to water and electrification as their key challenges and concerns. However, this was not reflected in the adaptation initiative they were engaged in – sunflower farming – allowing for the continued erosion of the community's capacity to adapt. In addition, the project had brought further burdens to women who were responsible for carrying water and caring for the sunflowers. What this suggests is that adaptation initiatives need to be accompanied by collective campaigns and advocacy that addresses key limitations in community capabilities and entitlements. Going beyond a neoliberal, individual and family-based focus draws attention to community-wide issues – as community-based adaptation should – and towards underlying mechanisms and systemic goals.

An overwhelming focus on income further reflects the neoliberalisation of resilience. Poverty was indeed a key contributing factor with regards to vulnerability, as outlined in Chapter Six, eroding the capabilities and entitlements of communities. Poverty was contributing to seasonal food insecurity, lack of access to services, lack of access to land, and constraining the capacity for forward planning. However, a focus on poverty and income alone is insufficient, particularly when such approaches overlook the underlying causes of poverty

(Parvin & Johnson, 2015). The initiatives observed in this study were helping to make modest improvements to family income and food security, but were doing little to expand the capabilities and entitlements of these families and communities more broadly. As Hafiza and Neelormi (2015) argue, small-scale, household based livelihood activities are unlikely to help families graduate out of levels of poverty. As with the example of the women's handicraft group in Baintola, while the initiative initially resulted in some extra income for the women involved, this initiative eventually resulted in significant exploitation, both in terms of pay and women's time. Microcredit initiatives were serving to maintain current farming practices, rather than building family assets or income. Many families still cited education as a major economic burden. In addition, the costs associated with adaptation initiatives including the use of adaptive seeds, was in itself limiting the capacity for these initiatives to address poverty on any significant scale. Small improvements to family income, that put the responsibility for responding to environmental change with families, can only go so far within a constrained social, political and economic system. This also highlights the deficiencies of development-led approaches to adaptation (Cannon & Müller-Mahn, 2010; Grist, 2008).

There were also questions regarding the capacity of small-scale schemes to address significant and unknown future risks, with a tendency within adaptation initiatives to focus on pre-defined notions of environmental change (Forsyth, 2013). Farmers and families interviewed were not in a position to engage in long-term planning, of the kind required to adapt to the potential impacts of climate change. This is in part due to their precarious economic condition, but also the result of a lack of understanding and knowledge regarding climate change. While communities did understand that changes had occurred in weather patterns, a lack of knowledge regarding the global causes and implications of climate change meant that communities were unable to position themselves in a process of long term change and risk. The precarious nature of economic conditions – such as families in Fakirhat who relied on microcredit loans each year in order to sustain their shrimp farms, or families still recovering from past natural disasters – meant that families were unable to devote economic resources to future risks. In addition, the long-term implications of climate change require long term planning, consultation and implementation that were not evident from neither NGOs nor government agencies. Such findings align with critiques of CBA (Forsyth, 2013), demonstrating the limited capacity for local responses to overcome wider economic, political and ecological issues.

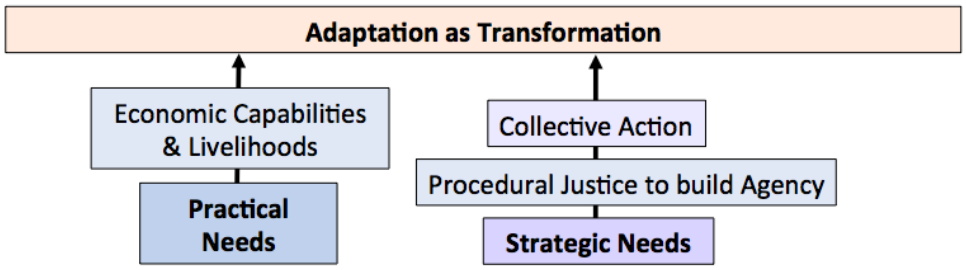
There was also evidence of a commitment among governments and NGOs to pursue technocratic, top-down responses that overlooked past environmental damage, reflecting a decontextualised approach and opening the risk of maladaptation. This included continued NGO and government support for saline-based shrimp farming, hybrid and modified crops and large amounts of climate funding going towards embankments. These initiatives are examples of climate policy being used as justification to extend the commodification of the Southwest, drawing power and resources away from affected communities, and further degrading environments. The ongoing pursuit of these options also ignores the historical outcomes that such initiatives have had in the region in the past. De-contextualisation extended to climate policy, as discussed in Chapters Four and Seven. The NAPA and the BCCSAP largely overlooked local-bound environmental changes, and included commitments to embankments, infrastructure and salt-based aquaculture. It seemed that these documents had not been written for the use and engagement of citizens and the civil society, manifesting in procedural and distributional injustices. The capacity for the BCCSAP to effect meaningful change was significantly compromised, given that so few local government officials knew about the policy, the policy was not translated into Bangla, and there was no engagement at the village level.

Operationalising Transformation: Policy and Practice

Given the above conclusions, the adaptation initiatives observed in Bagerhat were largely maladaptive in nature, failing to address the social and environmental mechanisms that underpin exposure, sensitivity, and limited adaptive capacity. While there was some evidence of micro-shifts in gendered power relations, many initiatives were serving to create a structural environment within which the responsibility to address environmental degradation was placed with families, despite the broader systemic political roots of such changes. In providing families with short-term relief, and minor improvements to income and support, initiatives were instead running the risk of maintaining existing economic, political and social systems that continue to erode natural environments, opening to the risk of collapse (Pelling, 2011). A ‘resilience’ approach was largely failing to interrogate underlying mechanisms, but rather served to recreate and perpetuate these structures (Pelling, 2011).

A reconceptualisation of adaptation in both global and local policy and practice is required, towards a more transformative approach. Pelling (2011) describes transformational adaptation as addressing the less visible causes of vulnerability, questioning priorities, boundaries and assumptions. Indeed, if we acknowledge the role that embedded social structures play in vulnerability, this later approach is essential. Transformative adaptation initiatives need find ways to respond to the political underpinnings of environmental change, micro-level power relations, and the broader political economy. Drawing on my findings in the field, and insights from the adaptation literature outlined in Chapter Two, I provide below an overview of a possible transformational adaptation approach in the context of Southwest Bangladesh, while setting out opportunities for future research. I draw here on ideas regarding strategic needs (Molyneux, 1985; Moser, 1989), sustainable and socially just adaptation (Eriksen et al. 2011; Thomas & Twyman, 2005) and gender justice and feminism (Lahiri-Dutt, 2012) to inform a transformative approach. As outlined in Figure 2.3, transformative adaptation needs to be addressing the underlying causes of exposure, sensitivity and limited adaptive capacity, by addressing both practical needs, and strategic needs, of communities and individuals. Key to furthering strategic needs is incorporating procedural justice, with distributed decision-making that puts the voices of those affected at the centre. Figure 8.1 outlines this.

Figure 8.1: Adaptation as Transformation



Source: Author

Addressing Exposure

Addressing the mechanisms underpinning exposure requires a regional and global approach, going beyond small-scale responses in individual communities which respond to manifestations alone. The above findings suggest the need to embed approaches to climate change in both local and regional political contexts, while responding to the urgency of local environmental issues that communities and institutional representatives identified. For the

Southwest, there is an urgent need for re-negotiation regarding the Farakka Barrage transboundary water sharing agreement, to ensure water security in the region, through the creation of a binding treaty (A. L. Khan, 2012). In terms of governance, a recontextualised approach to environmental exposure would require in-depth consultation, as well as initiatives to expand the use and implementation of climate policies – translating the BCCSAP into Bangla is an essential first step. The in-depth knowledge that communities did have around the historical and political roots of environmental change could be engaged in advocacy efforts around salinity, water and land rights at the local level. Efforts towards climate education, of which there was an early indication in some of the field sites, would open opportunities for enhanced procedural justice on regional and global scales. Future research should consider interdisciplinary approaches to examining the social and environmental underpinnings of the environmental issues identified here, and linking this to opportunities for collective action.

Addressing Sensitivity

Underlying sensitivity was a lack of capabilities and entitlements in a degraded resource base, requiring radical options for diversifying and strengthening agricultural livelihoods. Multifunctional agriculture, focused on adequate nourishment alongside production and productivity (Lahiri-Dutt, 2012), could include production for local markets to overcome the exploitation associated with export markets (as outlined in Chapters Five and Six). The capacity of the community in Chitolmari to continue sunflower farming, without the support of the establishing NGO, may be one such example, with men and women engaged in new forms of agriculture that were meeting family subsistence needs, as well as opportunities for income. In areas where salinisation is likely to be enduring and extending, a significant focus on tools and processes for collecting rainwater is needed, alongside considerations of the role that water collection plays for women's roles and identities. Collective action, as outlined by Hafiza and Neelormi (2015), would also be of particular value. There was some evidence of collective action in the case study communities. A ward-level disaster management committee (DMC) was functioning well in Hurka; the DMC system, despite major flaws in implementation, does provides a useful framework through which elements of socially-just adaptation could be pursued, providing a forum for gathering information, logging grievances, ensuring procedural justice, and connecting across geographies. This is

particularly pressing in Rampal, where the development of a coal-fired power plant sits alongside agriculture communities struggling with environmental issues likely to be exacerbated by climate change. The capacity of local-level institutions, such as DMCs, to address sensitivity by open opportunities for procedural justice, collective action and participatory democracy emerges as a key area for further research.

Building Adaptive Capacity

Addressing limitations in adaptive capacity requires going beyond improving the capacity of families alone, via improvements in income and farming, toward creating equitable structural environments within which affected communities, and women in particular, are able to achieve their rights, capabilities and entitlements. Women were often active agents in adaptation, but were working within social, environmental and economic constraints – exercising limited agency within the context of economic, social and political deprivation. While acknowledging the limitations of any individual project to achieve the kind of transformation being suggested here, there are a number of ideas that projects could incorporate to avoid maladaptation, and start to work towards the kind of change needed. Informed by gender justice, this needs to be led by approached that allow women to exercise agency beyond the confines of patriarchal social structures, both individually and collectively. This requires procedural justice, to develop initiatives that work towards both practical and strategic goals. Tschakert and Machado's (2012) concept of adaptive social protection, for example, combines community-based adaptation with social protection, in order to empower communities to exercise their voice and achieve their rights. Providing women with access to social safety nets would open opportunities for education, experimentation, and would avoid harmful coping responses such as early marriage, linking practical and strategic needs. Efforts towards building procedural justice would help to ensure that initiatives not only include women, but incorporate women's voices and concerns, to fulfil women's practical and strategic needs. Reforming local governance to overcome the barriers to women's participation in decision-making, and participatory exclusion, would help to empower women as political actors and bring women's knowledge to the fore (see Lahiri-Dutt, 2012). Research identifying opportunities for such structural change could be embedded in community-based projects, again identifying opportunities for collective action.

Loss and Damage

There is also the crucial question of loss and damage, with the risk that in some areas, we have reached the limits of adaptation (Warner et al., 2012). It may be the case that some areas are facing ecological collapse, and these environments may no longer be able to support agriculture or communities. Here again, a justice focus is crucial – the provision of global-level compensation, social services, participatory democracy, both at the community and regional level, will ensure that those communities faced with the prospect of migration are supported, and the responsibility is borne by those countries responsible for climate change. However, as Paprocki (2015) identifies, such an approach requires linking the complex environmental changes in the southwest to climate change, missing from current policy or practice. In addition, a more compelling argument may be the compensation that Bangladesh is owned more broadly as a result of a history of colonisation and extractive globalisation (Paprocki, 2015). Such questions offer a valuable space of future enquiry for political ecologists, at the intersection of politics, ethics and history.

Implications for Gender and Climate Research

The following section reflects on the implications of this study for future research and practice with regards to gender and climate change. As well as a number of theoretical and empirical contributions, I reflect on limitations associated with the study, which should be considered by future researchers in this field.

In terms of research practice, language barriers and a reliance on translation at times hampered the depth and quality of data gathering. With limited language skills, I transferred much trust and responsibility to my research assistant to provide accurate, real-time translations and assessment regarding meanings and values. Without the language skills, I was unable to grasp nuance, emotions or trepidations in responses that may have been important. Translated transcriptions at times revealed insights and utterances that had gone unquestioned or unexamined at the time of the interview. In addition, a number of interviews had to be re-transcribed several times, due to poor quality initial transcription and translation. While I was able to call on a number of colleagues with native Bangla skills to help me re-

interpret sections of interviews, the process of data collection, transcription and analysis would have been enhanced with a deeper knowledge of Bangla.

The participatory nature of the research was also limited in a number of ways. Firstly, a number of key parameters of the study were established prior to connecting with people in the case study villages, including overarching research questions, research tools and timeframe, and were adapted by myself and my research assistant, in response to key findings, and practicalities in the field, as opposed to via consultation with the case study communities. Secondly, the study itself was unable to engage in-depth in processes of social justice and empowerment that are possible and desirable within participatory feminist research (see Fortmann, 1996, for such an account). These limitations were the result of the short time frame in the field, as well as the language barriers between myself and my participants, and methodological gaps between myself, my research assistant, and NGOs assisting us in the field. This included diverging ideas as to what constituted good research, participation, and knowledge. For example, the communities themselves were accustomed to research projects of a short-term, extractive, and unequal nature. Future research should consider opportunities for longer-term engagement with communities, supported by local research teams skilled in cultural and language understandings.

In terms of contribution to theoretical and practical understandings, this study contributes to our understandings of 1) grounded understandings of vulnerability, 2) the need for adaptation as transformation and 3) the interactions between gender and climate change.

This study has expanded the conceptualisation of vulnerability, utilising the adaptive capacities vulnerability framework in conjunction with feminist political ecology, and theorisation around gender and climate justice. Such a framework allows for in-depth investigation regarding the ways in which communities experience environmental change. In particular, this study contributes to understandings of environmental vulnerability in Southwest Bangladesh as underpinned by both climate change, and locally bound environmental changes as a result of political and agricultural interventions and a history of neoliberalisation. Climate adaptation efforts, and environmental justice work, need to go hand-in-hand with efforts to address the outcomes of poor agricultural policy and planning. As well as utilising further the framework presented here, future sociological and

environmental research should focus on these political ecological relationships in order to better inform policy and practice.

This study has expanded critiques of adaptation, assessing the merits of neoliberal approaches to resilience and adaptation, and expanding the field of feminist political ecology in engaging more explicitly with tools for transformation and change. Building on the work of Parvin and Johnson (2015), a technocratic, neoliberal and development-focus was evident in both the national climate policy, and in adaptation implementation by NGOs. Adaptation initiatives were recreating established power structures, indicating the enduring nature of social norms, gender inequality in particular, and highlight the challenges, and necessity, in addressing such imbalances. NGOs and government, in many ways responsible, can draw on these findings to begin to reframe adaptation in more radical, and contextually relevant ways. Future research could consider more in-depth policy recommendations, expanding on the ideas in the above section regarding approaches to transformation, which could be incorporated into both government policy and NGO practice.

This work also contributes to the growing body of literature on gender and climate change in seeking to overcome key limitations in the existing literature regarding static and generalising approaches to gender. By drawing on intersectional feminist political ecology, gender is conceptualised as a fluid, changeable social practice constructed via relations and interactions with the environment. Such an approach allowed for the identification of gendered responses to environmental conditions, micro-shifts in gender roles and relations and diverse expressions of agency. For the women in the case study villages, micro and macro limitations around material and cultural entitlements were constraining women's adaptive capacity, while women themselves sought to maintain their responsibilities and identities under trying conditions. While this study is limited in terms of engagement with the experiences of men, I have sought to incorporate a more relational perspective, which sees gender as an outcome of social interactions. Future research and practice regarding gender and climate in Bangladesh should extend this perspective further, to identify further micro-shifts within which people inhabit and resist within the context of identity and material needs. In terms of practice, this research suggests the need for NGOs and government agencies to consider gender in a much more engaged way, combining practical and strategic goals, and beginning work with in-depth consultations that examines intersections and agency.

Final Thoughts

Climate change presents an ontological challenge to the way we arrange our communities, our food systems, and global relationships. In Bangladesh, climate change is likely to threaten the lives and wellbeing of thousands of people, many of whom are already living in precarious environments, and engaged in precarious livelihoods. The threat of disaster is the result of sustained processes of economic, political and ecological exclusion, that have left communities exposed, sensitive, and with limited capacity for meaningful adaptation. Here I have argued that the environmental challenges faced by communities in Southwest Bangladesh are the result of commodification of agriculture, with a political ecology where climate change intersected with agricultural interventions. Narrow agricultural livelihoods and limits in knowledge and governance meant that communities were particularly sensitive to these changes, with impacts on food and water security and livelihoods. Multifaceted poverty was preventing communities from taking proactive measures to environmental changes. Women face particular challenges across a spectrum of agricultural roles and responsibilities, including difficulties in accessing water, increased workloads both inside and outside of the home, pressures on homestead resources, and lack of safety in the likelihood of storms. In addition, women's adaptive capacity was constrained by limited entitlements and capabilities, including a lack of access to markets, resources and decision-making. Adaptation initiatives observed in the case study villages were failing to engage with the root 'mechanisms' underpinning vulnerability, and were often re-enforcing the mechanisms that were making communities vulnerable, and at worst, creating conditions for maladaptation.

These findings highlight the risks associated with approaches to adaptation that are gender-neutral, resilience-based, and focused on manifestations. Rather, these findings suggest the need for adaptation approaches and policies that are better informed by gender justice, feminism, climate justice and social justice. The social and political nature of vulnerability, including the gendered nature of vulnerability, calls for more transformative approaches to adaptation, that go beyond the symptoms of environmental change, and beyond small-scale, family-based responses. It is also important to acknowledge the scope of what is being posed here – this kind of significant, transformative structural change is beyond the scope for any individual project to achieve, but needs to be part of all adaptation initiatives for maladaptation to be avoided, and any change to occur. Collective action, equitable and participatory governance and decision-making to open power from below, and re-

contextualisation of environmental issues, may help to open opportunities for transformational adaptation, while also opening pathways for the deeper revolutionary change engendered by climate change.

References

Abedin, M. A., Habiba, U., & Shaw, R. (2013). Gender and Climate Change: Impacts and Coping Mechanisms of Women and Special Vulnerable Groups. In R. Shaw, F. Mallick, & A. Islam (Eds.), *Climate Change Adaptation Actions in Bangladesh* (pp. 165-184). New York: Springer.

Adaptation and Mitigation Knowledge Network. (2015). *Bagerhat.* Retrieved May 2, 2015 from http://amkn.org/ccafs-sites/bagerhat/

Adger, W. N. (2001). Scale of Governance and Envrionmental Justice for Adaptation and Mitigation of Climate Change. *Journal of International Development*, *13*, 921–931.

Adger, W. N. (2006). Vulnerability. *Global Environmental Change*, *16*(3), 268–281.

Adger, W. N. (2014). Social Capital , Collective Action, and Adaptation to Climate Change. *Economic Geography*, *79*(4), 387–404.

Adger, W. N., Arnell, N. W., & Tompkins, E. L. (2005). Successful Adaptation to Climate Change Across Scales. *Global Environmental Change*, *15*(2), 77–86.

Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., Naess, O.R., Wolf, J., & Wreford, A. (2009). Are There Social Limits to Adaptation to Climate Change? *Climatic Change*, *93*(3-4), 335–354.

Adger, W. N., & Kelly, M. (1999). Social Vulnerability to Climate Change and the Architecture of Entitlements. *Mitigation and Adaptation Strategies for Global Change*, *4*, 253–266.

Agarwal, B. (2001). Participatory Exclusions, Community Forestry, and Gender: An Analysis for South Asia and a Conceptual Framework. *World Development*, *29*(12), 1623–1648.

Ahmed, A. U. (2006). *Bangladesh Climate Change Impacts and Vulerabilities*. Dhaka: Climate Change Cell, Department of Envrionment.

Ahmed, F. Z., Greenleaf, A., & Sacks, A. (2014). The Paradox of Export Growth in Areas of Weak Governance: The Case of the Ready Made Garment Sector in Bangladesh. *World Development*, *56*, 258–271.

Ahmed, N., & Diana, J. S. (2015). Threatening "White Gold": Impacts of Climate Change on Shrimp Farming in Coastal Bangladesh. *Ocean & Coastal Management*, *114*, 42–52.

Ahmed, M. K., Halim, S., & Sultana, S. (2012). Participation of Women in Aquaculture in Three Coastal Districts of Bangladesh: Approaches Towards Sustanable Livelihoods. *World Journal of Agricultural Sciences*, *8*(3), 253-268.

Ahmed, N., Occhipinti-Ambrogi, A., & Muir, J. F. (2013). The Impact of Climate Change on Prawn Postlarvae Fishing in Coastal Bangladesh: Socioeconomic and Ecological Perspectives. *Marine Policy*, *39*(1), 224–233.

Ahmed, S. A., Diffenbaugh, N. S., & Hertel, T. W. (2009). Climate Volatility Deepens Poverty Vulnerability in Developing Countries. *Environmental Research Letters*, *4*(3), 1-8.

Ahmed, S., & Cokinos, C. (2017). How Does Ecological Modernization Explain Agriculture Adaptation in Coastal Bangladesh? A Critical Discussion. *Environmental Hazards*, *16*(2), 1–16.

Ahmed, T., Mahfuz, M., Ireen, S., Ahmed, A. M. S., Rahman, S., Islam, M. M., Alam, N., Hossain, M. I., Rahman, S. M. M., Ali, M. M., Choudhury, F. P., & Cravioto, A. (2012). Nutrition of Children and Women in Bangladesh: Trends and Directions for the Future. *Journal of Health, Population and Nutrition*, *30*(1), 1–11.

Ahsan, D., & Brandt, U. S. (2016). Climate Change and Coastal Aquaculture Farmers ' Risk Perceptions: Experiences from Bangladesh and Denmark. *Journal of Environmental Planning and Management*, *58*(9), 1649–1665.

Ahsan, M. N., & Warner, J. (2014). The Socioeconomic Vulnerability Index: A Pragmatic Approach for Assessing Climate Change Led Risks - A Case Study in the South-Western Coastal Bangladesh. *International Journal of Disaster Risk Reduction*, *8*, 32–49.

Akter, S., & Mallick, B. (2013). The Poverty-Vulnerability-Resilience Nexus: Evidence from Bangladesh. *Ecological Economics*, *96*, 114–124.

Alam, A. F. M. A., Asad, R., & Parvin, A. (2015). Climate Change Adaptation Through Grassroots Responses: Learning from the "Aila" Affected Coastal Settlement of Gabura, Bangladesh. In W. Leal Filho (Ed.), *Handbook of Climate Change Adaptation* (pp. 2011–2034). New York: Springer.

Alam, E., & Dominey-Howes, D. (2015). A New Catalogue of Tropical Cyclones of the Northern Bay Of Bengal and the Distribution and Effects of Selected Landfalling Events in Bangladesh. *International Journal of Climatology*, *35*, 801–835.

Alam, K., Shamsuddoha, M., Tanner, T., Sultana, M., Huq, M. J., & Kabir, S. S. (2011). The Political Economy of Climate Change Resilient Development Planning in Bangladesh. *IDS Bulletin*, *42*(3), 52–61.

Alam, M. R., Ali, M. A., Hossain, M. A., Islam, F., & Molla, M. S. H. (2009). Integrated Approach of Pond Based Farming Systems. *Bangladesh Journal of Agricultural Research*, *34*(December), 577–584.

Ali, A. M. S. (2006). September 2004 Flood Event in Southwestern Bangladesh: A Study of its Nature, Causes, and Human Perception and Adjustments to a New Hazard. *Natural Hazards*, *40*(1), 89–111.

Ali, A. N. M. A. (2013). Food Safety and Public Health Issues in Bangladesh: A Regulatory Concern. *European Food and Feed Law Review*, *8*(1), 31–40.

Allen, P. & Sachs, C. (2007). Women and Food Chains: The Gendered Politics of Food. *International Journal of Sociology of Food and Agriculture*, *15*(1), 1–23.

Alston, M. (2013). Women and Adaptation. *Wiley Interdisciplinary Reviews: Climate Change*, *4*(5), 351–358.

Alston, M. (2014). Gender Mainstreaming and Climate Change. *Women's Studies International Forum*, *47*, 287–294.

Alston, M. (2015). *Women and Climate Change in Bangladesh*. New York: Routledge.

Alston, M., & Akhter, B. (2016). Gender and Food Security in Bangladesh: The Impact of Climate Change. *Gender, Place & Culture*, *23*(10), 1450–1464.

Alston, M., & Kent, J. (2008). The Big Dry: The Link Between Rural Masculinities and Poor Health Outcomes for Farming Men. *Journal of Sociology*, *44*(2), 133–147.

Alston, M., & Whittenbury, K. (2013). Does Climatic Crisis in Australia's Food Bowl Create a Basis for Change in Agricultural Gender Relations? *Agriculture and Human Values*, *30*(1), 115–128.

Alston, M., Whittenbury, K., Haynes, A., & Godden, N. (2014). Are Climate Challenges Reinforcing Child and Forced Marriage and Dowry as Adaptation Strategies in the Context of Bangladesh? *Women's Studies International Forum*, *47*, 137–144.

Ambjornsson, E. L. (2011). *Power Relations And Adaptive Capacity: Exploring Gender Relations In Climate Change Adaptation And Coping Within Small-Scale Farming In Western Kenya* (Master's Thesis, Stockholm University, Stockholm Resilience Centre). Retrieved from http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A448540&dswid=-9538.

Amin, S., & Pebley, A. R. (1994). Gender Inequality within Households : The Impact of a Women's Development Programme in 36 Bangladeshi Villages. *The Bangladesh Development Studies*, *22*(2), 121–154.

Amin, S., Rai, A. S., & Topa, G. (2003). Does Microcredit Reach the Poor and Vulnerable? Evidence from Northern Bangladesh. *Journal of Development Economics*, *70*(1), 59–82.

Anik, S. I., & Khan, M. A. S. A. (2012). Climate Change Adaptation Through Local Knowledge in the North Eastern Region of Bangladesh. *Mitigation and Adaptation Strategies for Global Change*, *17*(8), 879–896.

Arnall, A., Oswald, K., Davies, M., Mitchell, T., & Ciorolo, C. (2010). *Adaptive Social Protection: Mapping the Evidence and Policy Context in the Agricultural Sector in South Asia* (*IDS Working Paper 345*). Brighton: Intititue of Development Studies.

Arora-Jonsson, S. (2011). Virtue And Vulnerability: Discourses on Women, Gender and Climate Change. *Global Environmental Change*, *21*(2), 744–751.

Auerbach, L. W., Goodbred Jr, S. L., Mondal, D. R., Wilson, C. A., Ahmed, K. R., Roy, K., Steckler, M. S., Small, C., Gillian, J. M., & Ackerly, B. A. (2015). Flood Risk of Natural and Embanked Landscapes on The Ganges–Brahmaputra Tidal Delta Plain. *Nature Climate Change*, *5*(2), 153–157.

Ayers, J. M., & Huq, S. (2009). The Value of Linking Mitigation and Adaptation: A Case Study of Bangladesh. *Environmental Management*, *43*(5), 753–764.

Bakker, K., & Bridge, G. (2006). Material worlds? Resource geographies and the `matter of nature'. *Progress in Human Geography*, *30*(1), 5–27.

Bangladesh Bureau of Statistics. (2013). *Bagerhat District Statistics.* Retrieved August 20, 2016 from http://www.bbs.gov.bd/WebTestApplication/userfiles/Image/District Statistics/Bagerhat.pdf

Bangladesh Bureau of Statistics. (2012). *Community Report Bagerhat Zila June 2012.* Retrieved August 20, 2016 from http://203.112.218.66/WebTestApplication/userfiles/Image/Census2011/Khulna/Bagerhat/Bagerhat at a glance.pdf

Bangladesh Centre for Advanced Studies. (2010). *Scoping Assessment on Climate Change Adaptation in Bangladesh*. Bangkok: AIT-UNEP.

Bangladesh Climate Change Cell. (2009). *Climate Change, Gender and Vulnerable Groups in Bangladesh*. *Comprehensive Disaster Management Plan*. Dhaka: Department of Envrionment.

Bangladesh Government Delegation. (2015). *Bangladesh Government Delegation, Paris.* Retrieved May 13, 2016 from http://unfccc6.meta-fusion.com/cop21/events/2015-12-08-15-00-bangladesh-government-delegation

Barnett, J., & O'Neill, S. (2010). Maladaptation. *Global Environmental Change*, *20*(2), 211–213.

Beck, U. (2010). Remapping Social Inequalities in an Age of Climate Change: For a Cosmopolitan Renewal of Sociology. *Global Networks*, *10*(2), 165–181.

Beck, U. (2014). How Climate Change Might Save the World. *Development and Society*, *43*(2), 169–183.

Beck, U. (2015). Emancipatory Catastrophism: What Does it Mean to Climate Change and Risk Society? *Current Sociology*, *63*(1), 75–88.

Bee, B. (2013). Who Reaps what is Sown? A Feminist Inquiry into Climate Change Adaptation in Two Mexican Ejidos. *ACME: An International E-Journal for Critical Geographies*, *12*(1), 131–154.

Bee, B. (2014). "Si No Comemos Tortilla, No Vivimos:" Women, Climate Change, and Food Security in Central Mexico. *Agriculture and Human Values*, *31*(4): 607–620.

Begum, U. K. M. S. A. (2011). *Modernisation, Vulnerability and Climate Change in Southwest Bangladesh* (PhD Thesis, University of Arizona, School of Anthropology). Retrieved from http://arizona.openrepository.com/arizona/handle/10150/205178

Belton, B. (2016). Shrimp, Prawn and the Political Economy of Social Wellbeing in Rural Bangladesh. *Journal of Rural Studies*, *45*, 230–242.

Bernstein, H. (2010). *Class Dynamics of Agrarian Change*. Nova Scotia: Fernwood.

Bhattacharya, D., Rahman, M., & Khatun, F. A. (1999). *Environmental Consequences of Structural Adjustment: Towards Sustainable Shrimp Culture in Bangladesh* (*Centre for Policy Dialogue Occasional Paper Series 2).* Dhaka: CDP.

Bhattarai, B., Beilin, R., & Ford, R. (2015). Gender, Agrobiodiversity, and Climate Change: A Study of Adaptation Practices in the Nepal Himalayas. *World Development*, *70*, 122–132.

Biersack, A. (2006). Reimagining Political Ecology: Culture/Power/History/Nature. In A. Biersack & J. B. Greenberg (Eds.), *Reimagining Political Ecology* (pp. 3–42). Copenhagen: Duke University Press.

Black, T. (2016). Race, Gender and Climate Injustice. In D. T. Phoebe Godfrey (Ed.), *Systemic Crises of Global Climate Change: Intersections of race, class and gender*. Oxon: Routledge.

Blunch, N. H., & Das, M. B. (2015). Changing Norms about Gender Inequality in Education: Evidence from Bangladesh. *Demographic Research*, *32*(1), 183–218.

Brammer, H. (2017). Floods, Cyclones, Drought and Climate Change in Bangladesh: A Reality Check. *International Journal of Environmental Studies*, *7233*(January), 1–22.

Braun, V., & Clarke, V. (2006). Using Thematic Analysis in Psychology. *Qualitative Research in Psychology*, *3*(2), 77–101.

Brisley, R., Welstead, J., Hindle, R., & Paavola, J. (2012). Socially Just Adaptation to Climate Change. *Jospeh Rowntree Foundation Report.* York: Joseph Rowntree Foundation.

Brooks, N., Adger, W. N., & Kelly, M. (2005). The Determinants of Vulnerability and Adaptive Capacity at the National Level and the Implications for Adaptation. *Global Environmental Change*, *15*(2), 151–163.

Buckingham, S., & Kulcur, R. (2009). Gendered Geographies of Environmental Injustice. *Antipode*, *41*(4), 659–683.

Buechler, S. (2009). Gender, Water, and Climate Change in Sonora, Mexico: Implications for Policies and Programmes on Agricultural Income-Generation. *Gender & Development*, *17*(1), 51–66.

Bushamuka, V., De Pee, S., Talukder, A., Kiess, L., Panagides, D., Taher, A., & Bloem, M. (2005). Impact of a Homestead Gardening Program on Household Food Security and Empowerment for Women in Bangladesh. *Food and Nutrition Bulletin*, *26*(1), 17–25.

Cannon, T. (2002). Gender and Climate Hazards in Bangladesh. *Gender and Development*, *10*(2), 45–50.

Cannon, T., & Müller-Mahn, D. (2010). Vulnerability, Resilience and Development Discourses in Context of Climate Change. *Natural Hazards*, *55*(3), 621–635.

Caraway, T. L. (2006). The Political Economy of Feminization: From “Cheap Labor” to Gendered Discourses of Work. *Politics & Gender*, *1*(03), 399–429.

CARE Bangladesh. (2006). *RVCC Final Report*. Dhaka: CARE Bangladesh.

CARE International. (2010). *Adaptation, Gender and Women’s Empowerment.* Retrieved July 20, 2015 from http://www.care.org/sites/default/files/documents/CC-2010-CARE_Gender_Brief.pdf

Carolan, M. S. (2005a). Realism without Reductionism: Toward an Ecologically Embedded Sociology. *Human Ecology Review*, *12*(1), 1-20.

Carolan, M. S. (2005b). Society, Biology, and Ecology: Bringing Nature Back Into Sociology’s Disciplinary Narrative Through Critical Realism. *Organization & Environment*, *18*(4), 393–421.

Carr, E. R. (2008a). Between Structure and Agency: Livelihoods and Adaptation in Ghana’s Central Region. *Global Environmental Change*, *18*(4), 689–699.

Carr, E. R. (2008b). Men’s Crops and Women’s Crops: The Importance of Gender to the Understanding of Agricultural and Development Outcomes in Ghana’s Central Region. *World Development*, *36*(5), 900–915.

Carr, E. R., & Thompson, M. C. (2014). Gender and Climate Change Adaptation in Agrarian Settings: Current Thinking, New Directions, and Research Frontiers. *Geography Compass*, *8*(3), 182–197.

Chafetz, J. S. (1990). *Gender Equity: An Integrated Theory of Stability and Change*. Newbury Park: Sage Publications.

Chafetz, J. S. (2006). The Varieties of Gender Theory in Sociology. In J. S. Chafetz (Ed.), *Handbook of the Sociology of Gender* (pp. 3-23). New York: Springer.

Chambers, R. (1997). *Who’s Reality Counts? Putting the First Last*. London: Intermediate Technology Publications.

Chandra, S. S. (2010). *Shortcut to the Frontline : Supporting Local NGOs on Climate Change in Bangladesh*. Dhaka: INTRAC & PRIP.

Chen, L. C., Huq, E., & D'Souza, S. (1981). Sex Bias in the Family Allocation of Food and Healthcare in Rural Bangladesh. *Population and Development Review*, *7*(1), 55–70.

Choudhury, M., Haque, C. E., & Habib, S. (2016). Participatory Exclusion of Women in Natural Resource Management: Silent Voices From Wetland Communities in Bangladesh. *Community Development Journal*, *June 2016*, 1–19.

Chowdhury, F. D. (2009). Problems of Women's Participation in Bangladesh Politics. *The Round Table*, *98*(404), 555–567.

Chowhan, G., & Barman, S. K. (2005). *The Reducing Vulnerability to Climate Change (RVCC) Project : Reflecting on Lessons Learned*. Dhaka: CARE Bangladesh.

Cinner, J. E., Huchery, C., Hicks, C. C., Daw, T. M., Marshall, N., Wamukota, A., & Allison, E. H. (2015). Changes in Adaptive Capacity of Kenyan Fishing Communities. *Nature Climate Change*, *5*(June), 872-877.

Clegg, S. (2006). The Problem of Agency in Feminism: A Critical Realist Approach. *Gender and Education*, *18*(3), 309–324.

Coates, J. C., Webb, P., Houser, R. F., Rogers, B. L., & Wilde, P. (2010). "He Said, She Said": Who Should Speak for Households About Experiences of Food Insecurity in Bangladesh? *Food Security*, *2*(1), 81–95.

Coirolo, C., Commins, S., Haque, I., & Pierce, G. (2013). Climate Change and Social Protection in Bangladesh: Are Existing Programmes Able to Address the Impacts of Climate Change? *Development Policy Review*, *31*(52), 74–90.

Collier, A. (1994). *Critical Realism: An Introduction to Roy Bhaskar's Philosophy*. Michigan: Verso.

Colucci, E. (2008). On the Use of Focus Groups in Cross-Cultural Research. In P. Liamputtong (Ed.), *Doing Cross-cultural Research: Ethical and Methodological Perspectives* (pp. 233–252). Netherlands: Springer.

Coulthard, S. (2012). Can We Be Both Resilient and Well, and What Choices Do People Have? Incorporating Agency into the Resilience Debate from a Fisheries Perspective. *Ecology and Society*, *17*(1), 4-15.

Crow, B., & Sultana, F. (2002). Gender, Class, and Access to Water: Three Cases in a Poor and Crowded Delta. *Society & Natural Resources, 15*(8), 709–724.

Danermark, B., Ekstrom, M., Jakobsen, L., & Karlsson, J. C. (1997). *Explaining Society: Critical Realism in the Social Sciences*. London: Routledge.

Dankelman, I. (2002). Climate change: Learning from Gender Analysis and Women's Experiences of Organising for Sustainable Development. *Gender & Development*, *10*(2), 21–29.

Dankelman, I., Alam, K. Ahmed, W. B., Gueye, Y. D., Fatema, N., & Mensah-Kutin, R. (2008). *Gender, Climate Change and Human Security: Lessons from Bangladesh, Ghana and Senegal*. Retrieved July 27, 2016 from http://wedo.org/gender-climate-change-human-security/

Dankelman, I. (2010). Introduction: Exploring Gender, Environment and Climate Change. In I. Dankelman (Ed.), *Gender and Climate Change: An Introduction* (pp. 1-20). London: Earthscan.

Dasgupta, S. (2014). *Facing the Hungry Tide Climate Change , Livelihood Threats , and Household Responses in Coastal Bangladesh (World Bank Group Policy Research Working Paper 7148).* Washington: The World Bank.

Dasgupta, S., Huq, M., Khan, Z. H., & Zahid, M. M. (2016). Cyclones in a Changing Climate : The Case of Bangladesh. *Climate and Development, 6*(2), 96-110.

Datta, D. K., Roy, K., & Hassan, N. (2007). Shrimp Culture: Trend, Consequences and Sustainability in the South-western Coastal Region of Bangladesh. In A L. Ramanathan, P. Bhattacharya, T. Dittmar, M. Bala Krishna Prasad & B. R. Neupane (Eds.), *Management and Sustainable Development of Coastal Zone Environments* (pp. 227–244). New York: Springer.

David, M., & Sutton, C. (2004). *Social Research: An Introduction*. London: Sage.

Davis. P., & Ali, S. (2014). *Exploring Local Perceptions of Climate Change Impact and Adaptation in Rural Bangladesh* (*IFPRI Disucssion Paper 01322*). Dhaka: IFPRI.

Davis, R., & Mcgregor, J. A. (2000). Civil Society , International Donors and Poverty in Bangladesh. *Commonwealth & Comparative Politics*, *38*(1), 47–64.

Deb, A. K. (1998). Fake Blue Revolution: Envrionmental and Socio-Economic Impacts of Shrimp Culture in The Coastal Areas Of Bangladesh. *Ocean and Coastal Management*, *41*, 63–88.

Del Ninno, C., Dorosh: A., & Smith, L. C. (2003). Public Policy, Markets and Household Coping Strategies in Bangladesh: Avoiding a Food Security Crisis Following the 1998 Floods. *World Development*, *31*(7), 1221–1238.

Delva, J., Allen-Meares:, & Momper, S. L. (2010). Conducting Community-Based Participatory Research. In J. Delva, P. Allen-Meares, & S. L. Momper (Eds.), *Cross-Cultural Research* (pp. 113–136). Oxford Scholarship Online.

Demetriades, J., & Esplen, E. (2010). The Gender Dimensions of Poverty and Climate Change Adaptation. In R. Mearns & A. Norton (Eds.), *Social Dimensions of Climate Change: Equity and Vulnerability in a Warning World*. Washington DC: The World Bank.

De Schutter, O. (2013). *The Agrarian Transition and the "Feminization" Of Agriculture*. Paper presented at the Food Sovereignty: A Critical Dialogue, International Conference, Yale University. Retrieved July 3, 2016 from https://www.tni.org/files/download/37_deschutter_2013.pdf

Dewan, C. (2014). The Imposition of Participation? The Case of Participatory Water Management in Coastal Bangladesh. *Water Alternatives*, *7*(2), 342–366.

Djoudi, H., & Bockhaus, M. (2011). Is Adaptation to Climate Change Gender Neutral? Lessons From Communities Dependent on Livestock and Forests in Northern Mali. *International Forestry Review*, *13*(2), 123-135.

Dunlap, R. E., & Catton, W. R. (1994). Struggling with Human Exemptionalism: The Rise, Decline and Revitalisation of Environmental Sociology. *The American Sociologist, 25*(1), 5-30.

Easton, G. (2010). Critical Realism in Case Study Research. *Industrial Marketing Management*, *39*(1), 118–128.

Egert, R. (2014). A Rising Tide Does Not Lift All Boats Equally: Gender and Hazards in Disaster Planning and Response. In L. W. Roeder (Ed.), *Issues of Gender and Sexual Oritentation in Humanitarian Emergencies* (pp. 75–97). New York: Springer.

Elmhirst, R. (2011). Introducing New Feminist Political Ecologies. *Geoforum*, *42*(2), 129–132.

Enarson, E. (2012). *Women Confronting Natural Disaster: From Vulnerability to Resilience.* London: Lynne Rienner.

Enarson, E., and Meyreles, L. (2004). International Perspectives on Gen- der and Disaster: Differences and Possibilities. *International Journal of Sociology and Social Policy 24*(10/11): 49–93.

Engle, N. L., & Lemos, M. C. (2010). Unpacking Governance: Building Adaptive Capacity to Climate Change of River Basins In Brazil. *Global Environmental Change*, *20*(1), 4–13.

Ensor, J. E., Park, S. E., Hoddy, E. T., & Ratner, B. D. (2015). A Rights-Based Perspective on Adaptive Capacity. *Global Environmental Change*, *31*, 38–49.

Ensor, J. E., Park, S. E., Attwood, S. J., Kaminski, A.M., & Johnson, J.E. (2016). Can Community-Based Adaptation Increase Resilience? *Climate and Development,* 1–18.

Eriksen, S., Aldunce:, Bahinipati, C. S., Martins, R. D., Molefe, J. I., Nhemachena, C., O'Brien, K., Olorunfemi, F., Park, J., Sygna, L., & Ulsrud, K. (2011). When Not Every Response to Climate Change is a Good One: Identifying Principles for Sustainable Adaptation. *Climate and Development*, *3*(1), 7–20.

Eriksen, S. H., & O'Brien, K. (2007). Vulnerability, Poverty and the Need for Sustainable Adaptation Measures. *Climate Policy*, *7*(4), 337–352.

Eskander, S. M., & Barbier, E. B. (2014). *Long-Run Impacts Of The 1970-74 Series Of Disasters In Bangladesh*. Retrieved July 20, 2016 from http://ssrn.com/abstract=2548744

Etzold, B., Ahmed, A. U., Hassan, S. R., & Neelormi, S. (2013). Clouds Gather in the Sky, But No Rain Falls: Vulnerability to Rainfall Variability and Food Insecurity in Northern Bangladesh and its Effects on Migration. *Climate and Development*, *6*(1), 1–10.

Fakirhat Disaster Management Committee (DMC). (2014). *Fakirhat Upazila Disaster Management Plan*. Dhaka: Ministry of Disaster Management and Relief.

Faruque, G., Sarwer, R. H., Karim, M., Phillips, M., Collis, W. J., Belton, B., & Kassam, L. (2016). The Evolution of Aquatic Agricultural Systems in Southwest Bangladesh in Response to Salinity and Other Drivers of Change. *International Journal of Agricultural Sustainability*, *15*(2), 185-207.

Feldman, S. (2001). Exploring Theories of Patriarchy: A Perspective from Contemporary Bangladesh. *Signs*, *26*(4), 1097–1127.

Fisher, S. (2010). Violence Agaisnt Women and Natural Disasters: Findings From Post-Tsunami Sri Lanka. *Violence Against Woment*, *16*(8), 908–918.

Food and Agriculture Organization (FAO). (2012). *Training Guide: Gender and Climate Change Research in Agriculture and Food Security for Rural Development*. Rome: FAO.

Food and Agriculture Organization (FAO). (2011). *The State of Food and Agriculture: Women in Agriculture.* Rome: FAO.

Food and Agriculture Organization (FAO). (2013). *Training Guide: Gender and Climate Change Research in Agriculture and Food Security for Rural Development (2nd Edition)*. Rome: FAO.

Forsyth, T. (2001). Critical Realism and Political Ecology. In A. Stainer & G. Lopez (Eds.), *After Postmodernism: Critical Realism?* (pp. 146-154). London: Athlone Press.

Forsyth, T. (2008). Political Ecology and the Epistemology of Social Justice. *Geoforum*, *39*(2), 756–764.

Forsyth, T. (2013). Community-Based Adaptation: A Review of Past and Future Challenges. *Wiley Interdisciplinary Reviews: Climate Change*, *4*(5), 439–446.

Füssel, H. M. (2007). Vulnerability: A Generally Applicable Conceptual Framework for Climate Change Research. *Global Environmental Change*, *17*(2), 155–167.

Füssel, H.-M., & Klein, R. J. T. (2006). Climate Change Vulnerability Assessments: An Evolution of Conceptual Thinking. *Climatic Change*, *75*(3), 301–329.

Gain, A. K., & Giupponi, C. (2014). Impact of the Farakka Dam on Thresholds of the Hydrologic: Flow Regime in the Lower Ganges River Basin (Bangladesh). *Water*, *6*(8), 2501–2518.

Galletta, A., & Cross, W. E. (2013). The Semi-Structured Interview as a Repertoire of Possibilities. In A. Galletta & W. E. Cross (Eds.), *Mastering the Semi-Structured Interview* (pp. 45–72). New York: NYU Press.

Gore, A. (2007). *An Inconvenient Truth: The Crisis of Global Warming.* New York: Penguin.

Government of Bangladesh. (2009). *Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2009.* Dhaka: Ministry of Envrionment and Forests.

Government of Bangladesh & International Union for the Conservation of Nature (IUCN). (2013). *Bangladesh Climate Change and Gender Action Plan*. Dhaka: Bangladesh Ministry of Environment and Forest.

Grant, S., Tamason, C. C., & Jensen, P. K. M. (2015). Climate Risk Management Climatization : A Critical Perspective of Framing Disasters as Climate Change Events. *Climate Risk Management*, *10*, 27–34.

Grist, N. (2008). Positioning Climate Change in Sustainable Development Discourse. *Journal of International Development*, *20*(6), 783–803.

Guillemin, M., & Gillam, L. (2004). Ethics, Reflexivity, and "Ethically Important Moments" in Research. *Qualitative Inquiry*, *10*(2), 261–280.

Gutierrez-Montes, I., Emery, M., & Fernandez-Baca, E. (2012). Why Gender Matters to Ecological Management and Poverty Reduction. In J. C. Ingram, F. DeClerck, & C. Rumbaitis del Rio (Eds.), *Integrating Ecology and Poverty Reducation* (pp. 39–59). New York: Springer.

Habiba, U., Abedin, M. A., Shaw, R., & Hassan, A. W. R. (2013a). Salinity-induced livelihood stress in coastal region of Bangladesh. In M. A. Abedin, U. Habiba, & R. Shaw (Eds.), *Water Insecurity: A Social Dilemma* (pp. 139–165). Bingley: Emerald Group.

Habiba, U., Hassan, A. W. R., & Shaw, R. (2013b). Livelihood Adaptation in the Drought Prone Areas of Bangladesh. In R. Shaw, F. Mallick, & A. Islam (Eds.), *Climate Change Adaptation Actions in Bangladesh* (pp. 227–252). New York: Springer.

Hadi, A. (2001). International Migration and the Change of Women's Position among the Left-Behind in Rural Bangladesh. *International Journal of Population Geography*, *7*, 53–61.

Hafiza, S., & Neelormi, S. (2015). *Climate Resilient and Empowering Livelihoods for Women (UN Women & Bangladesh Centre for Advanced Studies Report).* Dhaka: UN Women.

Hamid, M. A., & Alauddin, M. (1998). Coming Out of Their Homesteads?: Employment For Rural Women in Shrimp Aquaculture In Coastal Bangladesh. *International Journal of Social Economics*, *25*(2/3/4), 314–337.

Hanebuth, T. J. J., Kudrass, H. R., Linstädter, J., Islam, B., & Zander, A. M. (2013). Rapid Coastal Subsidence in The Central Ganges-Brahmaputra Delta (Bangladesh) Since the 17th Century Deduced From Submerged Saltproducing Kilns. *Geology*, *41*(9), 987–990.

Hanson, A.M.., & Buechler S. (2015). Towards a feminist political ecology of women, global change, and vulnerable waterscapes. In S. Beuchler & A.M. Hanson (Eds.), *A Political Ecology of Women, Water and Global Environmental Change*, (pp. 1-16), London: Routledge.

Haque, M. S. (2002). The Changing Balance of Power Between the Government and NGOs in Bangladesh. *International Political Science Review*, *23*(4), 411–435.

Harris, L. (2009). Gender and Emergent Water Governance: Comparative Overview of Neoliberalized Natures and Gender Dimensions of Privatization, Devolution and Marketization. *Gender, Place & Culture*, *16*(4), 387–408.

Harris, L. (2015). Hegemonic Water and Rethinking Natures Otherwise. In W. Harcourt and I. L. Nelson (Eds.), *Practicing Feminist Political Ecologies* (pp.157-181). London: Zed Books.

Harris-Fry, H., Azad, K., Kuddus, A., Shaha, S., Nahar, B., Hossen, M., Younes, L., Costello, A., & Fottrell, E. (2015). Socio-Economic Determinants of Household Food Security and Women's Dietary Diversity in Rural Bangladesh: A Cross-Sectional Study. *Journal of Health, Population and Nutrition*, *33*(2), 2-12.

Hart, A., New, C., & Freeman, M. (2004). Health Visitors and "Disadvantaged" Parent-Clients. In B. Carter & C. New (Eds.), *Making realism work: Realist social theory and empirical research* (pp. 151–170). London: Routledge.

Harvey, D. L. (2009). Complexity and Case. In D. Byrne & C. C. Ragin (Eds.), *The SAGE Handbook of Case-Based Methods* (pp. 15–38). London: SAGE.

Hasan, M. N., Hossain, M. S., Bari, M. A., & Islam, M. R. (2014). *Agricultural Land Availability in Bangladesh*. Dhaka: Soil Research Development Institute.

Hemmati, M., & Röhr, U. (2009). Engendering the Climate-Change Negotiations: Experiences, Challenges, and Steps Forward. *Gender & Development*, *17*(1), 19–32.

Hossain, I. (1998). Bangladesh-India Relations: The Ganges Water-Sharing Treaty and Beyond. *Asian Affairs*, *25*(3), 131–150.

Hossain, M. M. A. R., Kabir, H., Muhammad, A., Faruque, O., Hossain, M. M. A. R., & Reduction, D. R. (2015). Climate Change and Food Security in Vulnerable Coastal Zones of Bangladesh. In U. Habiba, M. A. Abedin, A. W. R. Hassan, & R. Shaw (Eds.), *Food Security and Risk Reduction in Bangladesh* (pp. 83–109). New York: Springer.

Hovorka, A. J. (2006). The No. 1 Ladies' Poultry Farm: A Feminist Political Ecology of Urban Agriculture in Botswana. *Gender, Place and Culture: A Journal of Feminist Geography*, *13*(3), 207–225.

Htun, M., & Weldon, S. L. (2012). The Civic Origins of Progressive Policy Change : Combating Violence against Women in Global Perspective, 1975–2005. *American Political Science Review*, *106*(3), 548-569.

Hughes, J. A. & Sharrock, W. W. (2007). *Theory and Methods in Sociology*. Basingstoke: Palgrave MacMillan.

Huq, K. A., Haque, M. M., Mazhabuddin, K., & Ahmed, S. U. (2007). Impacts of Different Agro-Ecological And Management Practices on The Shrimp Productivity of Ghers in The Southwest Coastal Region of Bangladesh. *Prograssive Agriculture, 18*(2), 149–155.

Huq, S., Rahman, A., & Konate, M. (2003). *Mainstreaming adaptation to climate change in least developed countries (LDCS)(IIED Briefing Paper)*. London: International Institute for Environment and Development.

Huq, S., & Reid, H. (2007). *Community-Based Adaptation: An IIED Breifing: A vital approach to the threat climate change poses to the poor*. London: IIED.

Hussain, S. G., & Iqbal, A. (2011). *Research Priorities in Bangladesh Agriculture*. Dhaka: BARC.

IPCC. (2001). *Climate Change 2001: Synthesis Report*. Retrieved January 22, 2016, from http://www.ipcc.ch/ipccreports/tar/vol4/index.php?idp=59

Iqbal, I. (2007). The Railways and the Water Regime of the Eastern Bengal Delta, c1845-1943. *International Quarterly for Asian Studies*, *38*(3/4), 329–354.

IRIN. (2011). *Bureaucratic Hitch Leaves Women Farmers High and Dry*. Retrieved January 15, 2014, from http://www.irinnews.org/Report/93851/BANGLADESH-Bureaucratic-hitch-leaves-women-farmers-high-and-dry

Irvine, F., Roberts, G., & Bradbury-Jones, C. (2008). The Researcher as Insider Versus the Researcher as Outsider: Enhancing Rigour Through Language and Cultural Sensitivity. In P. Liamputtong (Ed.), *Doing Cross-Cultural Research, Ethical and Methodological Perspectives* (pp. 35–48). Netherlands: Springer.

Islam, M. R. (2012). Vulnerability and Coping Strategies of Women in Disaster: A Study on Coastal Areas of Bangladesh. *Arts Faculty Journal*, *4*, 147–169.

Islam, M. S. (2008). From Pond to Plate: Towards a Twin-Driven Commodity Chain in Bangladesh Shrimp Aquaculture. *Food Policy*, *33*(3), 209–223.

Ito, S. (2002). From Rice to Prawns: Economic Transformation and Agrarian Structure in Rural Bangladesh. *Journal of Peasant Studies*, *29*(2), 47–70.

Ito, S. (2004). Globalization and Agrarian Change: A Case of Freshwater Prawn Farming in Bangladesh. *Journal of International Development*, *16*(7), 1003–1013.

Jackson, C. (1996). Rescuing Gender from the Poverty Trap. *World Development*, *24*(3), 489–504.

Jahan, R. (2014). The Parliament of Bangladesh: Representation and Accountability. *The Journal of Legislative Studies*, *21*(2), 250–269.

Jaim, W. M. H., & Hossain, M. (2011). *Women's Participation in Agriculture in Bangladesh 1988-2008: Changes and Determinants*. Paper presented at the 7th Asian Sociaety of Agricultural Economists (ASAE) Internaional Conference, Hanoi, Vietnam.

Jakobsen, K. (2012). Livelihood Asset Maps: A Multidimensional Approach to Measuring Risk-Management Capacity and Adaptation Policy Targeting—A Case Study in Bhutan. *Regional Environmental Change*, *13*(2), 219–233.

Johnson, A. (1996). "It"s Good to Talk': The Focus Group and the Sociological Imagination. *The Sociological Review*, *44*(3), 517–538.

Kabeer, N. (2012). *The Power of Association: Reflecting on Women's Collective Action as a Force for Social Change*. Retrieved July 22, 2016 from http://www.pathwaysofempowerment.org/archive_resources/the-power-of-association-reflecting-on-women-s-collective-action-as-a-force-for-social-change

Kabeer, N. (2011). Between Affiliation and Autonomy: Navigating Pathways of Women's Empowerment and Gender Justice in Rural Bangladesh. *Development and Change*, *42*(2), 499–528.

Kabeer, N. (2016). Gender Equality, Economic Growth, and Women's Agency: the "Endless Variety" and "Monotonous Similarity" of Patriarchal Constraints. *Feminist Economics*, *22*(1), 295–321.

Kabeer, N., Mahmud, S., & Tasneem, S. (2011). *Does Paid Work Provide a Pathway to Women's Empowerment? Empricial Findings from Bangladesh*. Dhaka: BRAC Development Institute.

Kandiyoti, D. (1988). Bargaining with Patriarchy. *Gender and Society*, *2*(3), 274–290.

Kandiyoti, D. (1998). Gender, Power and Contestation: Rethinking Bargaining with Patriarchy. In C. Jackson and R. Pearson (Eds.) *Feminist Visions of Development: Gender Analysis and Policy* (pp. 135–52). London: Routledge.

Karim, M., & Mimura, N. (2008). Impacts of Climate Change and Sea-Level Rise on Cyclonic Storm Surge Floods in Bangladesh. *Global Environmental Change*, *18*(3), 490–500.

Karim, M. R., & Islam, K. S. (1999). *Shrimp Culture around the Sundarbans and its Effects on Land , Agriculture , Livestock and Poultry: A Case Study of Some Selected Villages of Rampal Thana , Bagerhat District.* Paper presented at the National Seminar on The Sundarbans, The Largest Mangrove Forest on the Earth: A World Heritage Site, Khulna University.

Karim, M. R., & Thiel, A. (2017). Role of Community Based Local Institution for Climate Change Adaptation in the Teesta Riverine Area of Bangladesh. *Climate Risk Management, 17,* 93-103.

Kawser, M. A., & Samad, M. A. (2016). Political History of Farakka Barrage and its Effects on Environment in Bangladesh. *Bandung: Journal of the Global South*, *2*(16), 1-14.

Khan, M. A. (2010). Climate Change Vulnerabilities of South Asia and Future Options: A Governance Perspective. *Global Social Policy*, *10*(1), 12–15.

Khan, A. E., Ireson, A., Kovats, S., Mojumder, S. K., Khusru, A., Rahman, A., & Vineis: (2011a). Drinking Water Salinity and Maternal Health in Coastal Bangladesh: Implications of Climate Change. *Environmental Health Perspectives, 119*(9): 1328-1332.

Khan, A. E., Xun, W. W., Ahsan, H., & Vineis, P. (2011b). Climate Change, Sea-Level Rise, & Health Impacts in Bangladesh. *Environment: Science and Policy for Sustainable Development, 53*(5), 18–33.

Khan, A. L. (2012). Creative Adaptation: Bangladesh's Resilience to Flooding in a Changing Climate. In A. Lamadrid & I. Kelman (Eds.) *Climate Change Modelling For Local Adaptation in the Hindu Kush-Himalayan Region* (pp. 159-175). Bingley: Emerald Group.

Khan, M. Z. H. (2015). *Climate Change Vulnerability and Poverty Nexus: Climate Finance in Bangladesh.* Paper presented at the Gobeshona Climate Change Research Conference. Dhaka. Retrieved July 19, 2016 from http://gobeshona.net/wp-content/uploads/2015/01/Climate-Change-Vulnerability-and-Poverty-Nexus-Climate-Finance-in-Bangladesh.pdf

Khan, M. Z. K. (2012). Ganges Basin: A Example of Social Conflics Regarding Water Resources Especially in Developing Countries. *International Journal of Sustainable Society*, *4*(1/2), 158–172.

Khanom, S. (2011). Women's Labour under Stressed Environmental Conditions in Bangladesh. *Women and Envrionments International Magazine*, *86/87*, 28-29.

Kieran, C., Sproule, K., Doss, C., Quisumbing, A., & Kim, S. M. (2015). Examining Gender Inequalities in Land Rights Indicators in Asia. *Agricultural Economics (United Kingdom)*, *46*(March), 119–138.

Klein, N. (2014). *This Changes Everything: Capitalism vs. The Climate.* New York: Simon & Schuster.

Kumer, A., & Roy, D. (2017). An Investigation into the Major Environment and Climate Change Policy Issues in Southwest Coastal Bangladesh. *International Journal of Climate Change Strategies and Management*, *9*(1), 123–136.

Lahiri-Dutt, K. (2012). Climate Justice Must Integrate Gender Equality : What are the Key Principles? In V.I. Grover (Ed.), *Impact of Climate Change on Water and Health* (pp. 106–119). USA: CRC Press.

Leach, M. (1992). Gender and the Environment: Traps and Opportunities. *Development in Practice*, *2*(1), 12–22.

Lebel, L., Anderies, J. M., Campbell, B., Folke, C., & Hatfield-Dodds, S. (2006). Governance and the Capacity to Manage Resilience in Regional Social-Ecological Systems. *Ecology and Society*, *11*(1), 19-40.

Leichenko, R. M., & Silva, J. A. (2014). Climate Change and Poverty: Vulnerability, Impacts, and Alleviation Strategies. *Wiley Interdisciplinary Reviews: Climate Change*, *5*(4), 539–556.

Levay, A. V, Mumtaz, Z., Rashid, S. F., & Willows, N. (2013). Influence of Gender Roles and Rising Food Prices on Poor, Pregnant Women's Eating and Food Provisioning Practices in Dhaka, Bangladesh. *Reproductive Health*, *10*(53), 1–11.

Lever-Tracy, C. (2008). Global Warming and Sociology. *Current Sociology*, *56*(3), 445–466.

Lewis, D. (2011). *Bangladesh: Politics, Economy and Civil Society*. Cambridge: Cambridge University Press.

Liamputtong. P. (2008). Doing Research in a Cross-Cultural Context: Methodological and Ethical Challenges. In P. Liamputtong (Ed.), *Doing Cross Cultural Research* (pp. 3–20). Netherlands: Springer.

Local Government Engineering Department. (2017a). *Map of Bangladesh*. Retrieved July 9, 2016 from http://www.lged.gov.bd/ViewMap.aspx.

Local Government Engineering Department. (2017b). *Map of Bagerhat*. Retrieved July 9, 2016 from http://www.lged.gov.bd/ViewMap2.aspx?DistrictID=44.

MacGregor, S. (2009). A Stranger Silence Still: The Need for Feminist Social Research on Climate Change. *Sociological Review*, *57*(s2), 124–140.

MacGregor, S. (2010). "Gender and Climate Change": From Impacts to Discourses. *Journal of the Indian Ocean Region*, *6*(2), 223–238.

Mahmood, S. (2005). *Politics of Piety*. Princeton: Princeton University Press.

Mahmud, W., Ahmed, S., & Mahajan, S. (2008). *Economic Reforms, Growth, and Governance: The Political Economy Aspects of Bangladesh's Development Surprise.* (*Commission on Growth and Development Working Paper 22).* Washington: The World Bank.

Mahmud, W., & Mahmud, S. (2014). *Bangladesh: The Limits of a Developmental Welfare State under Governance.* Paper presented at the International Conference on Political Economy, Accountability and Governance, London.

Makita, R. (2009). The Visibility of Women's Work For Poverty Reduction: Implications From Non-Crop Agricultural Income-Generating Programs in Bangladesh. *Agriculture and Human Values*, *26*(4), 379–390.

Mallick, B., & Vogt, J. (2012). Cyclone, Coastal Society and Migration: Empirical Evidence from Bangladesh. *International Development Planning Review*, *34*(3), 217 – 240.

Mallick, D., & Rafi, M. (2010). Are Female-Headed Households More Food Insecure? Evidence from Bangladesh. *World Development*, *38*(4), 593–605.

Maplecroft. (2011). *Climate Change Vulnerability Index.* Retrieved April 2, 2016 from https://maplecroft.com/about/news/ccvi.html

Martinez Dy, A., Martin, L., & Marlow, S. (2014). Developing a Critical Realist Positional Approach to Intersectionality. *Journal of Critical Realism, 13*(5), 447–466.

Masum, S. J. H., & Hasan, M. M. M. (2013). *Climate Change Impact on Food Sovereignty in Bangladesh.* Retrieved April 2, 2015 from http://www.climatefrontlines.org/sites/default/files/Climate%20Change%20impact%20on%20Food%20Sovereignty%20in%20Bangladesh.pdf

May, T. (2011). *Social Research: Issues, Methods and Process* (Fourth Ed). New York: McGraw Hill.

McEvoy, P., & Richards, D. (2006). A Critical Realist Rationale for Using A Combination of Quantitative and Qualitative Methods. *Journal of Research in Nursing*, *11*(1), 66–78.

McIntyre, L., Rondeau, K., Kirkpatrick, S., Hatfield, J., Islam, K. S., & Huda, S. N. (2011). Food Provisioning Experiences of Ultra Poor Female Heads of Household Living in Bangladesh. *Social Science and Medicine*, *72*(6), 969–976.

McNamara, K. E., & McNamara, J. P. (2012). Using Participatory Action Research to Share Knowledge of the Local Environment and Climate Change: Case Study of Erub Island, Torres Strait. *The Australian Journal of Indigenous Education*, *40*, 30–39.

McLaughlin, P & Dietz, T. (2008). Structure, Agency and Environment: Toward an Integrated Perspective on Vulnerability. *Global Environmental Change*, *18*(1), 99–111.

Miah, G., Bari, N., & Rahman, A. (2010). Resource Degradation and Livelihood in the Coastal Region of Bangladesh. *Frontiers of Earth Science in China*, *4*(4), 427–437.

Ministry of Food and Disaster Management (2005). *Food Security in Bangladesh, National Workshop on Food Security in Bangladesh*. Dhaka: Ministry of Food and Disaster Management.

Ministry of Womens and Childrens Affairs (MOWCA). (2011). *National Database on Violence Against Women and Children.* Retrieved July 1, 2016, from http://www.mspvaw.gov.bd/index.php?option=com_content&view=article&id=236

Mirza, M. M. Q. (1998). Diversion of the Ganges Water at Farakka and Its Effects on Salinity in Bangaldesh. *Environmental Management*, *22*(5), 711–722.

Misra, M. (2016). Is Peasantry Dead? Neoliberal Reforms, the State and Agrarian Change in Bangladesh. *Journal of Agrarian Change*, *July 2016*, 1–18.

Molyneux, M. (1985). Mobilisation without Emanciptation? Women's Interests, the State and the Revolution in Nicaragua. *Feminist Studies*, *11*(2), 227–254.

Momsen, J. H. (2010). *Gender and Development*. London: Routledge

Moser, C. O. N. (1989). Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs. *World Development*, *17*(11), 1799–1825.

Munro, J., & Mcintyre, L. (2014). Why Should I Feed Her Less?: Challenging Assumptions on Daughter Discrimination in The Food Provisioning Values Of Ultrapoor Bangladeshi Female Heads Of Household. *Women's Studies International Forum*, *45*, 1–9.

Murphey, R. (2002). The Internalization of Autonomous Nature into Society. *Sociological Review*, *50*, 313–333.

Mustafa, D. (2003). Reinforcing Vulnerability? Disaster Relief, Recovery, and Response to the 2001 Flood in Rawalpindi, Pakistan. *Environmental Hazards*, *5*(3-4), 71–82.

National Institute of Population Research and Training. (2015). *Bangladesh Demographic and Health Survey 2014*. Retrieved July 19, 2016 from http://www.dghs.gov.bd/images/docs/Other_Publication/BanladeshDemographicHealthSurvey2014.pdf

Nazneen, S. (2010). *Rural Livelihoods and Gender (Asia-Pacific Human Development Report Background Papers Series 2010/08).* Dhaka: UNEP.

Nazneen, S., Hossain, N., & Sultan, M. (2011). *National Discourses in Women's Empowerment in Bangladesh: Continuities and Change* (*IDS Working Paper 368*). Brighton: Intititue of Development Studies.

Neelormi, S. (2010). Addressing Gender Issues in Adaptation. In A. U. Ahmed (Ed.), *Reducing Vulnerbaility to Climate Change* (p. 111–126). Dhaka: Centre for Global Change.

Neumayer, E., & Plumper, T. (2007). The Gendered Nature of Natural Disasters: The Impact of Catastrophic Events in the Gender Gap in Life Expectancy, 1981-2002. *Annals of the Americal Association of Gepgraphers*, *97*(3), 551–566.

New, C. (2005). Sex and Gender: A Critical Realist Approach. *New Formations*, *56*(Autumn), 1-19.

Nightingale, A. J. (2011). Bounding Difference: Intersectionality and The Material Production of Gender, Caste, Class and Environment In Nepal. *Geoforum*, *42*(2), 153–162.

Nussbaum, M. (2002). Capabilities and Social Justice. *International Studies Review, 4*(2), 123-135.

O'Brien, K., Leichenko, R., Kelkar, U., Venema, H., Aandahl, G., Tompkins, H., Javed, A., Bhadwal, S., Barg, S., Nygaard, L., & West, J. (2004). Mapping Vulnerability to Multiple Stressors: Climate Change and Globalization In India. *Global Environmental Change*, *14*(4), 303–313.

Oakley, E., & Momsen, J. H. (2005). Gender and Agrobiodiversity: A Case Study From Bangladesh. *The Geographical Journal*, *171*(3), 195–208.

Oakley, E., & Momsen, J. H. (2007). Women and Seed Management: A Study of Two Villages in Bangladesh. *Singapore Journal of Tropical Geography*, *28*(1), 90–106.

Olsen, W. (2004). Methodological Triangulation and Realist Research: An Indian Exemplar. In B. Carter & C. New (Eds.), *Making Realism Work: Realist Social Theory and Empirical Research* (pp. 135-150). New York: Routledge.

Olson, R. S. (2005). *A Critical Juncture Analysis, 1964-2003*. Retrieved June 18, 2016 from http://pdf.usaid.gov/pdf_docs/Pnadc353.pdf

Orr, A. (2012). Why were So Many Social Scientists Wrong about the Green Revolution? Learning from Bangladesh. *Journal of Development Studies*, *48*(11), 1565–1586.

Pandofelli, L., Meinzen-Dick, R., & Dohrm, S. (2008). Gender and Collective Action: Motivations, Effectiveness and Impact. *The Journal of International Development*, *96*(1), 10–14.

Paprocki, K. (2015). Anti-Politics of Climate Change. *Himal Southasian*, *28*(3), 54–64.

Paprocki, K. (2016). "Selling Our Own Skin:" Social Dispossession through Microcredit in Rural Bangladesh. *Geoforum*, *74*, 29–38.

Paprocki, K., & Cons, J. (2014). Life in a Shrimp Zone: Aqua- and other Cultures of Bangladesh's Coastal Landscape. *The Journal of Peasant Studies*, *41*(6), 1109–1130.

Parr, S. (2015). Integrating Critical Realist And Feminist Methodologies: Ethical and Analytical Dilemmas. *International Journal of Social Research Methodology*, *18*(2), 193–207.

Parveen, S. (2009). An Empirical Analysis of the Gender Division of Labour in Farm Households: Evidence from Bangladesh. *Bangladesh Research Publications Journal*, *2*(4), 693–699.

Parvin, A., & Johnson, C. (2015). Disaster Vulnerability in the Policy Context of Bangladesh: A Critical Review. In W. Leal Filho (Ed.), *Handbook of Climate Change Adaptation* (pp. 877–899). New York: Springer.

Parvin, G. A., & Ahsan, S. M. R. (2013). Impacts of Climate Change on Food Security of Rural Poor Women in Bangladesh. *Management of Environmental Quality: An International Journal*, *24*(6), 802–814.

Paul, A., Nath, B., & Abbas, R. (2013). Tidal River Management (TRM) and its Implication in Disaster Management : A Geospatial Study on Hari-Teka River Basin. *International Journal Of Geomatics And Geosciences*, *4*(1), 125–135.

Paul, A. K., & Røskaft, E. (2013). Environmental Degradation and Loss of Traditional Agriculture as Two Causes of Conflicts in Shrimp Farming in The Southwestern Coastal Bangladesh: Present Status and Probable Solutions. *Ocean & Coastal Management*, *85*, 19–28.

Pelling, M. (2011). *Adaptation to Climate Change*. Florence, US: Routledge.

Perry, B. (2011). Case Study Research. In T. May (Ed.), *Social Research: Issues, Methods and Process* (pp, 219-242). New York: McGraw Hill.

Pethick, J., & Orford, J. D. (2013). Rapid Rise in Effective Sea-Level in Southwest Bangladesh: Its Causes and Contemporary Rates. *Global and Planetary Change*, *111*, 237–245.

Poncelet, A., Gemenne, F., Martiniello, M., & Bousetta, H. (2010). A Country Made for Disasters: Environmental Vulnerability and Forced Migration in Bangladesh. In T. Afifi & J. Jager (Eds.), *Environment, Forced Migration and Social Vulnerability* (pp. 211–222). New York: Springer.

Pouliotte, J., Smit, B., & Westerhoff, L. (2009). Adaptation and Development: Livelihoods and Climate Change in Subarnabad, Bangladesh. *Climate and Development*, *1*(1), 31–46.

Preston, B., & Stafford-Smith, M. (2009). *Framing Vulnerability and Adaptive Capacity Assessment: Discussion paper (Climate Adaptation National Research Flagship).* Retrieved August 22, 2014 from www.csiro.au/org/ClimateAdaptationFlagship.html

Pritchard, B., Rammohan, A., Sekher, M., Parasuraman, S., & Choithani, C. (2013). *Feeding India: Livlihoods, Entitlements and Capabilities.* New York: Routledge.

Quisumbing, A. R. (2008). *Intergenerational Transfers and the Intergenerational Transmission of Poverty in Bangladesh: Preliminary Results from a Longitutdinal Study of Rural Households*. Washington DC: International Food Policy Research Institute Chronic Poverty Research Centre.

Rabbani, G., Rahman, A., & Mainuddin, K. (2013). Salinity-Induced Loss and Damage to Farming Households in Coastal Bangladesh. *International Journal of Global Warming*, *5*(4), 400–415.

Rahman, H., & Alam, K. (2016). Forest Dependent Indigenous Communities' Perception and Adaptation to Climate Change through Local Knowledge in the Protected. *Climate*, *4*(12), 1–25.

Rai, N., Huq, S., & Huq, M. J. (2014). Climate Resilient Planning in Bangladesh: A Review of Progress and Early Experiences of Moving from Planning to Implementation. *Development in Practice*, *24*(4), 527–543.

Rashid, A. K. M. M., & Khan, M. R. (2013). Community Based Adaptation: Theory and Practice. In R. Shaw, F. Mallick, & A. Islam (Eds.), *Climate Change Adaptation Actions in Bangladesh* (pp. 341–362). New York: Springer.

Rashid, S. R. (2013). Bangladeshi Women's Experiences of Their Men's Migration. *Asian Survey*, *53*(5), 883–908.

Reid, H., Alam, M., Berger, R., Cannon, T., Huq, S., & Milligan, A. (2009). *Community-Based Adaptation to Climate Change: An Overview (IIED Briefing Paper)*. London: International Institute for Environment and Development.

Reinharz, S. (1992). *Feminist Methods in Social Research.* New York: Oxford University Press.

Resurrección, B. P. (2011). *The Gender and Climate Debate: More of the Same of New Pathways of Thinking and Doing? (Asia Security Initiative Policy Series No. 10).* Singapore: RSIS Centre for Non-Traditional Security Studies.

Resurrección, B. P. (2013). Persistent Women and Environment Linkages in Climate Change and Sustainable Development Agendas. *Women's Studies International Forum*, *40*, 33–43.

Ribot, J. (2010). Vulnerability Does Not Fall from the Sky: Toward Multiscale, Pro-Poor Climate Policy. In R. Mearns & A. Norton (Eds.), *Social Dimensions of Climate Change: Equity and Vulnerability in a Warning World* (pp. 47-74). Washington: The World Bank.

Robbins, P. (2004). *Political Ecology: A Critical Introduction (1st Ed).* Oxford: Wiley-Blackwell.

Rocheleau, D., Thomas-Slayter, B., & Wangari, E. (1996). Gender and Environment. In D. Rocheleau, B. Thomas-Slayter, & E. Wangari (Eds.), *Feminist Political Ecology: Global Issues and Local Experiences* (pp. 3-26). Oxon: Routledge.

Rocheleau, D. (1995). Maps, Numbers, Text and Context: Mixing Methods in Femenist Political Ecology. *The Professional Geographer*, 47(4), 458–466.

Roy, M., Jahan, F., & Hulme, D. (2012). *Community and Institutional Responses to the Challenges Facing Poor Urban People in Khulna, Bangladesh in an Era of Climate Change*. Manchester: B.W.P. Institute.

Roy, M., & Venema, H.D. (2002). Reducing Risk and Vulnerability to Climate Change in India: The Capabilities Approach. *Gender and Development, 10,* 78 - 83.

Saha, C. K. (2014). Dynamics of Disaster-Induced Risk in Southwestern Coastal Bangladesh: An Analysis on Tropical Cyclone Aila 2009. *Natural Hazards*, *75*(1), 727–754.

Sarantakos, S. (2013). *Social Research (4th Ed).* New York: Palgrave MacMillan.

Sarker, A. E. (2006). The Political Economy of Decentralized Governance: An Assessment of Rural Local Government Reforms in Bangladesh. *International Journal of Public Administration*, *29*(13), 1285–1309.

Schiermeier, Q. (2014). Holding Back the Tide. Retrieved August 16, 2016 from http://www.nature.com/news/floods-holding-back-the-tide-1.15013

Schlosberg, D. (2012). Climate Justice and Capabilities: A Framework for Adaptation Policy. *Ethics & International Affairs*, *26*(04), 445–461.

Seferiadis, A. A., Cummings, S., Maas, J., Bunders, J. G., & Zweekhorst, M. B. (2017). From "Having The Will" to "Knowing The Way": Incremental Transformation for Poverty Alleviation Among Rural Women in Bangladesh. *Action Research, 7, 1-20.*

Seguino, S. (2008). Toward Gender Justice : Confronting Stratification and Unequal Power Toward Gender Justice : Confronting Stratification and Unequal Power. *Multidisciplinary Journal of Gender Studies*, *2*(1), 1–36.

Sen, A. (1999). *Development as Freedom*. New York: Knopf.

Shackleton, S., Ziervogel, G., Sallu, S., Gill, T., & Tschakert: (2015). Why is Socially-Just Climate Change Adaptation in Sub-Saharan Africa So Challenging? A Review of Barriers Identified from Empirical Cases. *Wiley Interdisciplinary Reviews: Climate Change*, *6*(May/June), 321-344.

Shahid, T. N. (2013). *Islam and Women in the Constitution of Bangladesh: The Impact on Family Laws for Muslim Women (Policy Brief)*. Oxford: The Foundation for Law, Justice and Society.

Shameem, M. I. M., Momtaz, S., & Rauscher, R. (2014). Vulnerability of Rural Livelihoods to Multiple Stressors: A Case Study from the Southwest Coastal Region of Bangladesh. *Ocean & Coastal Management*, *102*, 79–87.

Shamsuddoha, M., & Chowdhury, R. K. (2007). *Climate Change Impacts and Disaster Vulnerabilities in the Coastal Areas of Bangladesh*. Dhaka: COAST.

Shannon, K., Mahmud, Z., Asfia, A., & Ali, M. (2008). The Social and Environmental Factors Underlying Maternal Malnutrition In Rural Bangladesh: Implications for Reproductive Health and Nutrition Programs. *Health Care for Women International*, *29*(8), 826–840.

Sheuli, S. A. (2013). *Feminization of Bangladesh's Agriculture.* Retrieved June 20, 2014, from http://asia.ifad.org/web/bangladesh/home/-/news/7929/newsletter.

Sood, A., & Mathukumalli, B. K. P. (2011). Managing international river basins: Reviewing India-Bangladesh transboundary water issues. *International Journal of River Basin Management*, *9*(October), 43–52.

Sovacool, B. K., & Linnér, B. O. (2016). *The Political Economy of Climate Change Adaptation*. London: Palgrave MacMillan.

Stevens, P. (2012). Towards an Ecosociology. *Sociology*, *46*(4), 579–595.

Sultana, F. (2006). Gendered Waters, Poisoned Wells: Political Ecology of the Arsenic Crisis in Bangladesh. In K. Lahiri-Dutt (Ed.), *Fluid Bonds: Views on Gender and Water*. Kolkata: Stree Publishers.

Sultana, F. (2007a). Reflexivity, Positionality and Participatory Ethics: Negotiating Fieldwork Dilemmas in International Research. *ACME: An International E-Journal for Critical Geographies*, *6*(3), 374–385.

Sultana, F. (2007b). Water, Water Everywhere But Not a Drop to Drink: Pani Politics (Water Politics) in Rural Bangladesh. *International Feminist Journal of Politics*, *9*(4), 494–502.

Sultana, F. (2009). Fluid Lives: Subjectivities, Gender and Water in Rural Bangladesh. *Gender, Place & Culture*, *16*(4), 427–444.

Sultana, F. (2012). Water, Culture and Gender: An Analysis from Bangladesh. In B. R. Johnston, L. Hiwasaki, I. J. Klaver, A. Ramos Castillo, & V. Strang (Eds.), *Water, Cultural Diversity, and Global Environmental Change: Emerging Trends, Sustainable Futures?* (pp. 237–252). London: Springer.

Sultana, F. (2014). Gendering Climate Change: Geographical Insights. *The Professional Geographer*, *66*(3), 372–381.

Swapan, M. S. H., & Gavin, M. (2011). A Desert in the Delta: Participatory Assessment of Changing Livelihoods Induced by Commercial Shrimp Farming in Southwest Bangladesh. *Ocean & Coastal Management*, *54*(1), 45–54.

Swarup, A., Dankelman, I., Ahluwaila, K., & Hawrylyshyn, K. (2011). *Weathering the Storm: Adolescent Girls and Climate Change*. Surrey: Plan International.

Terry, G. (2009). No Climate Justice Without Gender Justice: An Overview of the Issues. *Gender & Development*, *17*(1), 5–18.

The Asia Foundation. (2011). *A Situation Analysis of Climate Change Adaptation Initiatives in Bangladesh*. Dhaka: The Asia Foundation.

The World Bank. (2010). *Economics of Adaptation to Climate Change: Bangladesh*. Washington: The World Bank.

The World Bank. (2015). *Fertility Rate, Total (Births per Woman).* Retrieved September 2, 2016 from http://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=BD

The World Bank. (2017). *Poverty and Equity: Bangladesh.* Retrieved March 24, 2017 from http://povertydata.worldbank.org/poverty/country/BGD

Thomas, D. S. G., & Twyman, C. (2005). Equity and justice in climate change adaptation amongst natural-resource-dependent societies. *Global Environmental Change*, *15*(2), 115–124.

Tierney, K. (2015). Resilience and the Neoliberal Project: Discourses, Critiques, Practices-And Katrina. *American Behavioral Scientist*, *59*(10), 1327–1342.

Tompkins, E. L., & Adger, W. N. (2004). Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society*, *9*(2), 10.

Truelove, Y. (2011). (Re-)Conceptualizing water inequality in Delhi, India through a feminist political ecology framework. *Geoforum*, *42*(2), 143–152.

Tschakert, P. (2012). From impacts to embodied experiences: tracing political ecology in climate change research. *Geografisk Tidsskrift-Danish Journal of Geography*, *112*(2), 144–158.

Tschakert, P. (2016). *The Role of Inequality in Climate-Poverty Debates (World Bank Group Policy Research Working Paper 7677).* Washington: The World Bank.

Tschakert, P. & Machado, M. (2012). Gender Justice and Rights in Climate Change Adaptation: Opportunities and Pitfalls. *Ethics and Social Welfare*, *6*(3), 275–289.

Turnbull, M., Sterrett, C. L., & Hilleboe, A. (2013). *Toward Resilience*. Warwickshire: Practical Action Publishing.

United Nations Environment Programme (UNEP). (2011). Women at the Frontline of Climate Change: A Rapid Response Assessment. Retrieved May 15, 2016 from http://wedocs.unep.org/handle/20.500.11822/7985

United Nations Children's Fund (UNICEF). (2014). *Bagerhat District Equity Profile*. Retrieved February 9, 2017 from http://www.bagerhat.gov.bd/sites/default/files/www.bagerhat.gov.bd/Bagerhat Equity Profile_Final.pdf

United Nations Development Programme (UNDP). (2016). *Gender Inequality Index*. Retrieved February 9, 2017 from http://hdr.undp.org/en/composite/GII

United States Agency for International Development (USAID) & Food and Agriculture Organization (FAO). (2014). *Gender Strategy: Strengthening the Environment, Forestry and Climate Change Capacities of the Ministry of Environment and Forests and its Agencies.* Retrieved August 14, 2016 from http://pdf.usaid.gov/pdf_docs/PBAAE251.pdf

Uraguchi, Z. B. (2010). Food Price Hikes, Food Security, and Gender Equality: Assessing the Roles and Vulnerability of Women in Households of Bangladesh and Ethiopia. *Gender & Development*, *18*(3), 491–501.

Vineis, P., Chan, Q., & Khan, A. (2011). Climate Change Impacts on Water Salinity and Health. *Journal of Epidemiology and Global Health*, *1*(1), 5–10.

Vij, S., & Narain, V. (2016). Land, Water & Power : The Demise of Common Property Resources in Periurban Gurgaon, India. *Land Use Policy*, *50*, 59–66.

Warner, K., & Afifi, T. (2013). Where the Rain Falls: Evidence from 8 Countries on how Vulnerable Households Use Migration to Manage the Risk of Rainfall Variability and Food Insecurity. *Climate and Development*, *6*(1), 1–17.

Warner, K., Van Der Geest, K., Kreft, S., Huq, S., Harmeling, S., Kusters, K., & de Sherbinin, A. (2012). *Evidence from the Frontlines of Climate Change: Loss and Damage to Communities despite Coping and Adaptation* (*Loss and Damage in*

Vulnerable Countries Initiative Policy Report Vol. 9). Bonn: United Nations University Institute for Environment and Human Security (UNU-EHS).

Water Resource Planning Organisation (WARPO). (2004). *National Water Management Plan: Regional Plans.* Dhaka: Ministry of Water Resources.

Watts, M. (2015). Now and Then: The Origins Of Political Ecology and The Rebirth Of Adaptation as a Form Of Thought. In T. Perreault, G. Bridge & J. McCarthy (Eds.), *The Routledge Handbook of Political Ecology* (pp. 19-50), London: Routledge.

Weber, H. (2014). Global Politics of Microfinancing Poverty in Asia: The Case of Bangladesh Unpacked. *Asian Studies Review, 38*(4), 544–563.

Wilbanks, T. J., & Kates, R. W. (1999). Global Change in Local Places: How Scale Matters. *Climatic Change*, *43*, 601–628.

Wilson, K. (2013). Agency as 'Smart Economics': Neoliberalism, Gender and Development. In In S. Madhok, A. Phillips, K. Wilson, & C. Hemmings (Eds.) *Gender, Agency, and Coercion* (pp. 84-101). New York: Palgrave Macmillan.

Wilson, K. (2015). Towards a Radical Re-appropriation: Gender , Development and Neoliberal Feminism. *Development and Change*, *46*(4), 803–832.

Wise, R. M., Fazey, I., Stafford Smith, M., Park, S. E., Eakin, H. C., Archer Van Garderen, E. R. M., & Campbell, B. (2014). Reconceptualising Adaptation to Climate Change as Part of Pathways of Change and Response. *Global Environmental Change*, *28*, 325–336.

World Economic Forum (WEF). (2016). *Global Gender Gap Index*. Retrieved January 20, 2017, from http://reports.weforum.org/global-gender-gap-report-2016/

World Food Programme (WFP). (2013). *Bangladesh Food Security Monitoring Bulletin, Issue No. 15, Oct-Dec 2013, Dhaka.* Retrieved October 10, 2014 from http://www.wfp.org/content/bangladesh-food-security-monitoring-system-2013

World Food Programme (WFP) & The World Bank (2013). *Upper Poverty Map 2010.* Retrieved September 6, 2015 from

http://documents.wfp.org/stellent/groups/public/documents/communications/wfp267449.jpg

World Food Programme (WFP) & The World Bank (2014). Bangaldesh Poverty Maps. Retrieved January 20, 2017 from https://www.wfp.org/news/news-release/latest-bangladesh-poverty-maps-launched-bbs-world-bank-and-wfp

World Health Organisation (WHO). (2002). *Gender and Health in Disasters*. Retrieved September 6, 2015 from http://apps.who.int/iris/bitstream/10665/68886/1/a85575.pdf

Wright, H., Kristjanson, P., & Bhatta, G. (2012). *Understanding Adaptive Capacity: Sustainable Livelihoods and Food Security in Coastal Bangladesh (CGIAR Research Program on Climate Change, Agriculture and Food Security Working Paper 32).*Copenhagen: CGAIR.

Wynn, D., & Williams, C. K. (2012). Principles for Conducting Critical Realist Case Study Research in Information Systems. *MIS Quarterly*, *36*(3), 787–810.

Yin, R. K. (2012). *Applications of Case Study Research*. London: SAGE.

Yu, W. H., Alam, M., Hassan, A., Khan, A. S., Ruane, A. C., Rosenzweig, C., Major, D., & Thurlow, J. (2012). *Climate Change Risks and Food Security in Bangladesh*. London: Earthscan.

Zara, C., Weiss, C., & Parkinson, D. (2013). *Men on Black Saturday: Men, Masculinities, Disasters, A Literature Review*. Wangaratta: Women's Health Golbourn North East.

Zehr, S. (2015). The Sociology of Global Climate Change. *Wiley Interdisciplinary Reviews: Climate Change*, *6*(2), 129–150.

APPENDIX A: Interview Schedule for Local Participants

Introduction	*Purpose*
Introduce myself, the project, establish consent	
I'm interested to know firstly, a bit about you, and your family Name? Are you married? How many children do you have? Where is your home village? What religion do you practice? Have you been to school? What is your main job? How long have you lived here?	*Establish background and livelihoods*
Roles, livelihoods, farming, assets	
What you usually do during the week? Do you have *hashmurgi*/cows/vegetables? Are these men's/women's jobs? Where did you learn these skills? What does your husband do? Are there any things you would like you husband/wife to help you with? Have you ever in the past: worked outside of the house? Done a different job? Who **owns the land** that you work on? How have you come to own this? **Discuss farming practices** What types of rice/fish/shrimp/etc Do you use pesticides? What are current prices like?	*Establish roles & responsibilities around food and livelihoods*
Are you participating in microcredit? Have you take out any loans? Do you have any savings with a bank or NGO? When did this start? What NGOs?	*Establish livelihoods*
Food Security	
What do you usually eat? **Fish/Meat:** How often do you eat fish/meat/vegetables? **Water:** Where do you get water? Is it sweet water? **Fruit:** Do you have fruit trees? Buy fruit? What would need to happen to improve your family's diet? Do you feel that your family eats well/enough?	*Establish food security*
Where does your family get its food from? Where is the market? How many months per year can you reply on your own production? Who decides what is grown? Who decides what is sold? What are the prices like to buy/sell?	*Establish roles & responsibilities around food and livelihoods*
Environmental Change, Vulnerability and Resilience	
Reflect on findings from focus groups **Has the environment changed since you arrived?** **What did the village look like when you arrived?** Has the soil changed? Has the weather changed? Temperature changed? Have the rivers changed? **Fruit farming** – what has changed? Why? **Rice farming** – what has changes? Do you use IRRI or deshi dhan? **Vegetables** – what has changed? Why? **Animals/livestock** – what has changed? Why?	*Vulnerability and environmental change*

Do you have viruses on the ghers? What has CAUSED these changes? Manmade/natural? Were you here during the cyclones? What did you do? Have there been any lasting impacts (salinity/debt/waterlogging)? Did you/neighbors get any NGO support? Do you know about climate change?	
Adaptation	
How has your family dealt with these changes? How have you adapted/adjusted? Do you do these things differently before Sidr/Aila? Do you use different water to water plants? Any training or techniques? Organic farming? Assistance from NGOs? Have you gotten any assistance from NGOs? Have you gotten any assistance from the Government? Who decided? Who helped you? Where did you get the information from? Have your neighbours made these changes also? Have these adaptations/changes been successful? Are you pleased that you made these changes? Better FS/income? Is there anyone from your household who is migrating? Did anyone leave after Sidr/Aila? Where have people gone? Why?	*Processes of adaptation* *Governance of adaptation* *Success/meaningfulness of adaptation* *Note how men/women are involved*
Future	
What is the biggest challenge that your family is facing? **In comparison to your neighbours, how do you think your 'wellbeing' is?** What does your family/your community need to deal with these changes? What would you like the government to do? What would you like NGOs to do?	*Adaptation needs/governance responses*
What will your village/community look like in the future? What will your home/farm/land look like in the future? What are your hopes for your children?	

APPENDIX B: Interview Schedule for Institutional Representatives

Introduction	
Introduce myself, the project, establish ethical consent	
Can you tell me a bit about your role within *(organisation)?*	
Food Security	
What is the current food security situation in Rampal/Bagerhat/Khulna/Bangladesh?	What key food security factors are at play – availability? Access?
What are the major food security policies and programs being implemented?	Where is funding from these projects/policies coming from? Who is implementing them?
What are the major threats/challenges to food security in Bangladesh?	Climate change? Environmental changes? Food prices? Poverty?
What are the major institutions that are involved with food/food security?	
Environmental Change, Vulnerability and Resilience	
What do you see as the links between environmental change and food security?	
What is your understanding of the environmental situation in the SW/Khulna region?	What has been the effect of the Farraka Barrage? What are the anticipated effects of the Rampal power station?
What particular challenges are women facing with regards to environmental change?	
Who is the most vulnerable, and why?	
Adaptation	
How do you *define* adaptation, and the role of adaptation in Bangladesh?	What are the key goals of adaptation? How do you know when adaptation has been successful?
What are the major adaptation policies and programs being implemented?	What are the underlying theories of change/rationale on which these projects are built? Why have these projects been chosen/pursued?
What has been the outcome for Bangladesh in terms of international negotiations around adaptation?	What has been the influence of global discussions/policies/discourses? How are Bangladesh and India collaborating with regards to adaptation?
Question regarding adaptation and power relations	
Future	
What do you see as the future of adaptation on Bangladesh?	What projects/policies need to be implemented?

APPENDIX C: Ethical Approval Form

THE UNIVERSITY OF QUEENSLAND

Institutional Human Research Ethics Approval

Project Title:	Environmental Change And Gendered Connections To Food Security In Southwest Bangladesh
Chief Investigator:	Ms Amy MacMahon
Supervisor:	Geoffrey Lawrence, Adil Khan
Co-Investigator(s):	None
School(s):	School of Social Science
Approval Number:	2014000701
Granting Agency/Degree:	APA
Duration:	31st May 2016

Comments/Conditions:

Expedited Review - Low Risk

Note: if this approval is for amendments to an already approved protocol for which a UQ Clinical Trials Protection/Insurance Form was originally submitted, then the researchers must directly notify the UQ Insurance Office of any changes to that Form and Participant Information Sheets & Consent Forms as a result of the amendments, before action.

Name of responsible Committee:
Behavioural & Social Sciences Ethical Review Committee
This project complies with the provisions contained in the *National Statement on Ethical Conduct in Human Research* and complies with the regulations governing experimentation on humans.

Name of Ethics Committee representative:
Associate Professor John McLean
Chairperson
Behavioural & Social Sciences Ethical Review Committee

Signature _____ Date 28/5/2014

APPENDIX D: List of Participants

Hurka - Interviews				
#	**Gender**	**Age**	**Livelihood**	**Landowner**
1.	Woman	35	Veg, chickens	Land
2.	Woman	60s	Housework, and union member	Land
3.	Man	40s	Local government, crabs and rice	20 acres, owned and rented
4.	Man	40s	Crabs	Land
5.	Women	20s	Chickens	No land
6.	Woman	40s	Goats	Little land
7.	Woman	25	Chickens	Little land
	Man	30s	Crab, shrimp, fish	
	Man	70s	Vegetables	
8.	Woman	40s	NGO staff member	-
9.	Woman	50s	Women's Group & housework	Little land
10.	Woman	40s	Day Labour	8 kata land
11.	Man	65	Snack selling	Land
12.	Woman	40s	Women's group convener	Land
13.	Man	50s	Day Labour	Little land
14.	Local Government Official			

Fakirhat				
#	**Gender**	**Age**	**Livelihood**	**Land**
1.	Woman	20s	Insurance company	No land
2.	Woman	50	Housework	Land
3.	Woman	25	Housework and cows	Land
4.	Woman	20	Housework and childcare	No land
5.	Woman	40	Housework and vegetables	Land, 2 bigha, currently leased out
6.	Woman	38	Housework and dairy cows	Land, 1.5 bigga
7.	Woman	40	Housework, rice work	1.5 Bigha
	Woman	40	Housework, rice work	-
8.	Man	60s	Housework, cows	6 Kata & share a pond
	Woman	50s	Gher and rice	
9.	Man	50s	Gher and rice	Some land
10.	Man	50s	Gher and rice	Some land
11.	Woman	40s	Vegetables, chickens, ducks	Some land, leased & owned, and some leased out under bondok system
12.	Woman	40s	Day labour, cows, poultry	Land leased out under bondok system
13.	Woman	60s	Milk selling	No land
14.	Woman	60s	Aquaculture	Some land, leased & owned
15.	Local Government Official			

Chitolmari - Interviews				
#	Gender	Age	Livelihood	Land
1.	Man	40s	Aquaculture, rice, sunflowers	Some land
	Man	50s	Aquaculture, rice, sunflowers	Some land
	Man	50s	Aquaculture, rice, sunflowers	Some land
2.	Woman	40s	Housework, cattle, ducks	Leasing 2 bigha
3.	Man	31	Aquaculture, sunflowers	32 shotok
4.	Woman	30s	Eggs, sunflowers	90 shotok
	Woman	30s	Sunflowers	Little land
5.	NGO Staff, Agriculture			
6.	Local Government Official			

Khulna & Dhaka - Interviews	
1.	Government Official, Soil
2.	Government Official, Water
3.	Government Official, Animals
4.	Government Official, Agriculture
5.	Academic, Environmental Science
6.	NGO Staff, Gender Issues
7.	NGO Staff, Development
8.	NGO Staff, Environment
9.	Government Official, Aquaculture
10.	Government Official, Forestry
11.	Academic, Urban Planning
12.	Academic, Agriculture
13.	NGO Staff, Environment
14.	NGO Staff, Nutrition
15.	NGO Staff, Environment
16.	Academic, Development
17.	Government Official, Gender Issues
18.	Academic, Environment & Development
19.	NGO Staff, Microcredit
20.	NGO Staff, Fisheries
21.	NGO Staff, Rural Development
22.	NGO Staff, Climate Change Adaptation
23.	NGO Staff, Climate Change Adaptation
24.	Local Government Representative
25.	NGO Staff, Environmental Research
26.	Academic, Gender and Development (Dhaka)
27.	NGO Staff, Fisheries (Dhaka)
28.	NGO Staff, Environmental Research
29.	UN Staff, Gender Issues (Dhaka)
30.	Academic Research Centre (Dhaka)
31.	National Government Department (Dhaka)
32.	Advocacy Organisation (Dhaka)